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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N76-22150# Instituut TNO voor Werktuigkundige Constructies, Delft (Netherlands).
SIMPLE MATHEMATICAL MODEL OF A FIRING MECHANIZED ANTI-AIRCRAFT GUN [EENVOUDING MATHEMATISCH MODEL VAN SCHIETEND GEMECHANISEERD LUCHTAFWEERGESCHUT]
R. Regoord Nov. 1974 36 p refs In DUTCH
(Contract A74/KL/040)
(IWEKO-11279/1; TDCK-65675) Avail: NTIS HC $4.00

A simple two-dimensional model of mechanical anti-aircraft artillery without shock absorbers, for studying the dynamic behavior during firing, is presented. Stiffnesses and eigen frequencies were calculated; mass moments of inertia were estimated. The recoil forces of the guns were approximated using analytical functions which were also used for shock response calculations. The computer program is described and the data still to be verified are indicated. ESA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N76-22151 Johns Hopkins Univ., Baltimore, Md.
UNSTEADY RESPONSE OF AN AIRFOIL TO WAKE CUTTING Ph.D. Thesis
Hajime Fujita 1972 140 p
Avail: Univ. Microfilms Order No. 76-8486

An experimental study of a transient interaction between an airfoil and passing wake, commonly known as 'wake cutting,' was carried out in order to contribute to basic understanding of interaction problems between successive blade rows in turbomachinery. An open jet (30 cm square orifice, 38 m/s nominal velocity) was cut periodically by moving circular rods (1 cm diameter) in pin-wheel fashion and a periodic moving row of wakes was produced. A circular arc symmetric airfoil equipped internally with a pressure transducer was placed in the jet. In order to extract the periodic component of the signals by suppressing the random, turbulent signal, a special processing technique was employed. Dissert. Abstr.

N76-22152 Michigan Univ., Ann Arbor.
STALLED AND PARTIALLY STALLED HIGH ASPECT RATIO, STRAIGHT WINGS Ph.D. Thesis
Earl Floyd Weener 1975 234 p
Avail: Univ. Microfilms Order No. 76-9541

A computer investigation of the steady state load distribution on high aspect ratio, straight wings at geometric angles of attack near and beyond stall was conducted. The load distributions were computed using Multhopp's Fourier series solution of the downwash integralin Prandtl's lifting line theory. Analog computer solutions at high angles of attack exhibited sharp changes or jumps of the variables which were due to instabilities of the nonlinear system. The stability properties were examined via linearized equations written about singular operating points of the nonlinear system. For a specific wing model, stability is shown explicity in terms of the slopes of the local airfoil characteristics. Dissert. Abstr.

N76-22153 Rhode Island Univ., Kingston.
A STUDY OF THE DRAG CHARACTERISTICS AND POLYMER DIFFUSION IN THE BOUNDARY LAYER OF AN AXISYMMETRIC BODY Ph.D. Thesis
John Emanuel Sirmalis 1975 255 p
Avail: Univ. Microfilms Order No. 76-8960

Limited data obtained in pipe flow and flat plate flow experiments on ejection into development boundary layers indicate a drastic reduction in polymer requirements for equivalent percent drag reductions. Extension to axisymmetric flow could result in significant achievable gains in volume utilization. The object of the research described herin was to examine the processes described above through measurement of wall and boundary layer concentration profiles and through a photographic study of the boundary layer. Tests were performed with fresh water ejection and solutions of the drag reducing Polymer, polyox WSR-301. Predictive analytical routines were developed and experimentally verified. Dissert. Abstr.

N76-22154* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AIRFOIL SHAPE FOR FLIGHT AT SUBSONIC SPEEDS Patent
Richard T. Whitcomb, inventor (to NASA) Issued 27 Apr. 1976 14 p Filed 9 Nov. 1971 Supersedes N73-14981 (11 - 06, p 0613)
(NASA-Case-LAR-10585-1; US-Patent-3,952,971; US-Patent-Appl-SN-197183; US-Patent-Class-244-35R; US-Patent-Class-244-40R) Avail: US Patent Office CSCL 01A

An airfoil is examined that has an upper surface shaped to control flow accelerations and pressure distribution over the upper surface and to prevent separation of the boundary layer due to shock wave formulation at high subsonic speeds well above the critical Mach number. A highly cambered trailing edge section improves overall airfoil lifting efficiency. Diagrams illustrating supersonic flow and shock waves over the airfoil are shown.
Official Gazette of the U.S. Patent Office

N76-22155*# DCW Industries, Sherman Oaks, Calif.
COMPUTATION OF TURBULENT BOUNDARY LAYERS ON CURVED SURFACES, 1 JUNE 1975 - 31 JANUARY 1976
D. C. Wilcox and T. L. Chambers Jan. 1976 100 p refs
(Contract NAS2-8884)
(NASA-CR-137853; DCW-R-07-01) Avail: NTIS HC $5.00 CSCL 01A

An accurate method was developed for predicting effects of

streamline curvature and coordinate system rotation on turbulent boundary layers. A new two-equation model of turbulence was developed which serves as the basis of the study. In developing the new model, physical reasoning is combined with singular perturbation methods to develop a rational, physically-based set of equations which are, on the one hand, as accurate as mixing-length theory for equilibrium boundary layers and, on the other hand, suitable for computing effects of curvature and rotation. The equations are solved numerically for several boundary layer flows over plane and curved surfaces. For incompressible boundary layers, results of the computations are generally within 10% of corresponding experimental data. Somewhat larger discrepancies are noted for compressible applications. Author

N76-22156*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF PERFORATED FLAP SURFACES AND SCREENS ON ACOUSTICS OF A LARGE EXTERNALLY BLOWN FLAP MODEL

Robert J. Burns, Daniel J. McKinzie, Jr., and Jack M. Wagner Washington Apr. 1976 41 p refs

(NASA-TM-X-3335; E-8559) Avail: NTIS HC $4.00 CSCL 01A

Various model geometries and combinations of perforated flap surfaces and screens mounted close to the flap surfaces were studied for application to jet-flap noise attenuation for externally blown flap, under-the-wing aircraft. The efforts to reduce jet-flap interaction noise were marginally successful. Maximum attenuations of less than 4 db in overall sound pressure level were obtained in the flyover plane. Noise reductions obtained in the low-to-middle-frequency ranges (up to 7 db) were generally offset by large increases in high-frequency noise (up to 20 db). Author

N76-22157*# Scientific Translation Service, Santa Barbara, Calif.

RIGOROUS METHOD FOR THE DETERMINATION OF THE MEAN CAMBER LINE FOR PROFILES OF UNKNOWN CAMBER

K. Bausch Washington NASA Apr. 1976 17 p Transl. into ENGLISH from Techn. Berichte (West Ger.), v. 11, 1944 p 11-16

(Contract NASw-2791)

(NASA-TT-F-17004) Avail: NTIS HC $3.50 CSCL 01A

The rigorous solution of the problem of finding the camber line for an arbitrary lifting profile with unknown curvature leads to an ordinary differential equation of the first order. Using known graphical and numerical solution methods, the camber line can be found rapidly as the integral curve of the differential equation. Author

N76-22158*# General Applied Science Labs., Inc., Westbury, N.Y.

EXPERIMENTAL INVESTIGATION OF WALL SHOCK CANCELLATION AND REDUCTION OF WALL INTERFERENCE IN TRANSONIC TESTING

Antonio Ferri and Gerald Roffe [1975] 36 p

(Contract NAS1-13616)

(NASA-CR-144979) Avail: NTIS HC $4.00 CSCL 01A

A series of experiments were performed to evaluate the effectiveness of a three-dimensional land and groove wall geometry and a variable permeability distribution to reduce the interference produced by the porous walls of a supercritical transonic test section. The three-dimensional wall geometry was found to diffuse the pressure perturbations caused by small local mismatches in wall porosity permitting the use of a relatively coarse wall porosity control to reduce or eliminate wall interference effects. The wall porosity distribution required was found to be a sensitive function of Mach number requiring that the Mach number repeatability characteristics of the test apparatus be quite good. The effectiveness of a variable porosity wall is greatest in the upstream region of the test section where the pressure differences across the wall are largest. An effective variable porosity wall in the down stream region of the test section requires the use of a slightly convergent test section geometry. Author

N76-22159*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

COMPARISON OF SUPERCRITICAL AND CONVENTIONAL WING FLUTTER CHARACTERISTICS

Moses G. Farmer, Perry W. Hanson, and Eleanor C. Wynne May 1976 9 p refs Presented at the AIAA/ASME/SAE 17th Struct., Structural Dyn., and Mater. Conf., Valley Forge, Pa., 5-7 May 1976

(NASA-TM-X-72837) Avail: NTIS HC $3.50 CSCL 01A

A wind-tunnel study was undertaken to directly compare the measured flutter boundaries of two dynamically similar aeroelastic models which had the same planform, maximum thickness-to-chord ratio, and as nearly identical stiffness and mass distributions as possible, with one wing having a supercritical airfoil and the other a conventional airfoil. The considerations and problems associated with flutter testing supercritical wing models at or near design lift coefficients are discussed, and the measured transonic boundaries of the two wings are compared with boundaries calculated with a subsonic lifting surface theory. Author

N76-22160*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SRB WATER IMPACT VELOCITY TRADE STUDY

Duane N. Counter and Charles D. Crockett Apr. 1976 63 p

(NASA-TM-X-64997) Avail: NTIS HC $4.50 CSCL 01A

The results of the attrition/cost studies which formulated the data base for the recommendation to reduce the Space Shuttle Solid Rocket Booster's nominal vertical water impact velocity to 85 feet per second is presented. Author

N76-22161*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF COOLANT FLOW EJECTION ON AERODYNAMIC PERFORMANCE OF LOW-ASPECT-RATIO VANES. 1: PERFORMANCE WITH COOLANT EJECTION HOLES PLUGGED

Jeffrey E. Haas and Milton G. Kofskey Washington Apr. 1976 18 p refs Prepared in cooperation with Army Air Mobility Res. and Development Lab., Cleveland, Ohio

(NASA-TM-X-3395; E-8611) Avail: NTIS HC $3.50 CSCL 01A

The aerodynamic performance of a low aspect ratio turbine vane designed with coolant flow ejection holes on the vane surfaces was experimentally determined in a full-annular cascade with the coolant ejection holes plugged. The purpose was to establish a baseline for comparison with tests where flow is ejected from the vane surfaces. The vanes were tested over a mean-section ideal critical velocity ratio range of 0.64 to 0.98. This ideal critical velocity ratio corresponds to the vane inlet total to vane aftermixed static pressure ratio at the mean section. The variations in vane efficiency and aftermixed flow conditions with circumferential and radial position were obtained. Author

N76-22162# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

COVARIANCE ERROR ANALYSIS OF A MISSILE TRAJECTORY IN AN ATMOSPHERIC FLIGHT

I. Y. Bar-Itzhack and A. Bar-Gill Jan. 1976 35 p refs

(TAE-271) Avail: NTIS HC $4.00

An analysis is presented of the position and the orientation errors which develop during the atmospheric flight of a missile. It is assumed that during this stage the autopilot employs body angle guidance where the true missile orientation is measured by a directional gyro and by a vertical gyro. The reference body orientation is stored in the guidance computer. The analysis employs the covariance propagation technique to the error state vector of the missile trajectory. The mathematical model is a six-degree-of-freedom model, however, it is assumed that the angular time constants of the autopiloted missile are negligible. The linear state equation of the error vector, which is required for the covariance analysis, is obtained by a piecewise linearization of the nonlinear airframe model about the reference trajectory. It is concluded that the error sources are: the cross wind, the error in the determination of zero lift drag coefficient, the part of the thrust deviation which affects the specific impulse and the gyro initial misalignments. Author

N76-22163# Louvain Univ. (Belgium).

A STUDY OF THE TURBULENT BOUNDARY LAYER AT MACH 15 AND 19.8 ON THE WALL OF A CONICAL NOZZLE

E. Backx and B. E. Richards 18 Mar. 1976 33 p refs Backup document for AIAA Synoptic, 'A High Mach Number turbulent Boundary Layer Study', scheduled for publication in AIAA Journal in Aug. 1976
Avail: NTIS HC $4.00

Surveys of total temperature, pitot pressure, and mass flow were made in the turbulent boundary layer on the wall of the Longshot conical nozzle at Mach 15 and 19.8. The ratio of wall to total enthalpy was respectively 0.15 and 0.11. The Reynolds number based on momentum thickness was larger than 20,000. Using these experimental data, distributions of turbulent properties such as mixing length and turbulent Prandtl number were obtained from the boundary layer equations. Author

N76-22164*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
STEADY INCOMPRESSIBLE VARIABLE THICKNESS SHEAR LAYER AERODYNAMICS
M. R. Chi Jan. 1976 48 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal, Aug. 1976
(Grant NGR-31-001-197)
(NASA-CR-147100; AMS-1259) Avail: NTIS HC $4.00 CSCL 01A

A shear flow aerodynamic theory for steady incompressible flows is presented for both the lifting and non lifting problems. The slow variation of the boundary layer thickness is considered. The slowly varying behavior is treated by using multitime scales. The analysis begins with the elementary wavy wall problem and, through Fourier superpositions over the wave number space, the shear flow equivalents to the aerodynamic transfer functions of classical potential flow are obtained. The aerodynamic transfer functions provide integral equations which relate the wall pressure and the upwash. Computational results are presented for the pressure distribution, the lift coefficient, and the center of pressure travel along a two dimensional flat plate in a shear flow. The aerodynamic load is decreased by the shear layer, compared to the potential flow. The variable thickness shear layer decreases it less than the uniform thickness shear layer based upon equal maximum shear layer thicknesses. Author

N76-22165# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
INVESTIGATION ON AIRFOIL RECOMPRESSION TYPES IN COMPRESSIBLE AND INCOMPRESSIBLE FLOW INCLUDING VISCOUS EFFECTS Thesis - Tech. Univ. Munich
Peter Stenglin 17 Oct. 1974 156 p refs In GERMAN; ENGLISH summary
(MBB-UFE-1158-O) Avail: NTIS HC $6.75

The incompressible flow investigation of recompression types for profiles by A.M.O. Smith was extended to include compressible flows. The pressure distribution of the profile's upper side was optimized with respect to the local lift coefficient taking viscous effects into consideration. Several profiles were obtained with optimal lift upper sides and lower side pressure distribution defined by design criteria. These were tested for practical usefulness. ESA

N76-22166# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
THEORETICAL AND NUMERICAL INVESTIGATIONS ON THE AERODYNAMICS OF A YAWING WING-BODY-TAIL CONFIGURATION (AIRBUS) Thesis - Tech. Univ. Munich
Ulrich Klaus 19 Jun. 1974 159 p refs In GERMAN; ENGLISH summary
(MBB-UFE-1164-O) Avail: NTIS HC $6.75

The MBB panel method was used to calculate the pressure distribution for an Airbus A300 B2 type wing-body-tail configuration for straight and yawing flight. The following items were investigated: lift distribution on wing, fuselage and vertical tail with special regard to the interference in straight and yawing flight; and rolling moment of the wing-body-vertical tail combination. Effects of sweep and vee shape, as well as the vertical tail, are discussed. ESA

N76-22167# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
MEASUREMENTS OF THE REYNOLDS STRESS TENSOR IN A THREE-DIMENSIONAL TURBULENT BOUNDARY LAYER UNDER INFINITE SWEPT WING CONDITIONS
A. Elsenaar and S. H. Boelsma 3 Jul. 1974 114 p refs
(NLR-TR-74095-U) Avail: NTIS HC $5.50

Measurements were made on a wind tunnel model of the six components of the Reynolds stress tensor in a three-dimensional incompressible turbulent boundary layer under infinite swept wing conditions in an adverse pressure gradient, with a three-dimensional separation near the trailing edge. These measurements complement the mean velocity measurements that were carried out earlier in the same test set-up. The measurements were carried out with a rotatable X-wire probe. An extensive discussion of the errors involved in this type of measurement is given. Turbulence intensities and turbulent shear stresses were measured. From the mean velocity profiles the velocity gradient was derived and compared with the shear stress magnitude and direction. An interpretation of the results is included.
Author (ESA)

N76-22168# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
TWO-DIMENSIONAL WIND TUNNEL EXPERIMENTS WITH SINGLE AND DOUBLE SLOTTED FLAPS Final Report
Bjoern L. G. Ljungstroem Oct. 1975 70 p refs
(Contract STU-73-4381)
(FFA-TN-AU-1083) Avail: NTIS HC $4.50

Experiments were carried out with a two-dimensional high lift wing based on a NACA 65 sub 2-215 profile. Five different configurations were optimized, including one single slotted flap and two different double slotted flaps with a relatively large first element. The best maximum lift results are 4.28 for a single slotted flap (with leading edge slat) and 4.8 for both the alternative double slotted flaps (with leading edge slat). Results were compared with those of earlier tests with the same model. The double slotted flaps with larger first elements appear to have better drag characteristics (higher maximum L/D) than the more conventional vane type flaps. The maximum lift coefficient is, however, slightly lower (4.8 compared to 5.0). Slat efficiency is shown to increase with increasing trailing edge flap angle and complexity. An attempt was made to study the effect of Reynolds number in the range from 1.83 to 2.23 x 1 million. Further investigations of Reynolds number effects in a pressurized tunnel are recommended. Author (ESA)

N76-22169# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
A NUMERICAL SIMULATION OF THE RAREFIED HYPERSONIC FLAT PLATE PROBLEM
D. I. Pullin and J. K. Harvey Sep. 1975 41 p refs
(Contract SRC-B/RG/4313)
(IC-Aero-75-08) Avail: NTIS HC $4.00

The direct simulation Monte-Carlo method for the full Boltzmann equation is applied to the problem of rarefied hypersonic flow of rotationally excited N2 past the leading edge of a two-dimensional flat plate aligned with the free stream. An approximate collision model representing rotational-translational energy exchanges is developed for use in the calculations. The effects of this and other inelastic collision models and of the single parameter Maxwell gas-surface interaction law on the flow in the kinetic/transition regime is discussed. Author (ESA)

N76-22170# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE THREE SHOCK CONFLUENCE PROBLEM FOR THE CASE OF NORMALLY IMPINGING OVEREXPANDED JETS
Gautam T. Kalghatgi and B. L. Hunt [1974] 90 p refs
(BLH/7402; PG/GTK/7402) Avail: NTIS HC $5.00

A systematic account of the triple shock intersection problem covering all possible types of triple shock intersections, has been presented. This problem has been studied in the particular context of the triple shock intersection arising due to the normal impingement of an overexpanded jet issuing from a contoured nozzle. A detailed discussion of the interesting cases where supersonic flow exists on one side of the slipstream at the triple shock intersection point is included. The cases where a thermodynamically possible analytic solution is either non-existent or physically impossible are discussed. For cases where more than one thermodynamically possible analytical solution exist, a

quantitative discussion which takes into consideration non-homentropic effects is presented to establish the physical possibilty of these solutions. The possibility that for some cases the shock curvatures at the triple point might tend to infinity and invalidate the classical solution of the triple shock problem is considered. The knowledge of the conditions at the triple point has been used along with the boundary conditions for the normal impingement problem to construct qualitative flow pictures for contoured nozzles operating at all possible combinations of exit Mach number and degree of overexpansion. Finally, some experimental evidence in the form of schlieren pictures is presented. This evidence, though by no means conclusive, supports the theory. Author (ESA)

N76-22171# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

COMMENTS ON MEASURING TECHNIQUES FOR UNSTEADY DERIVATIVES

J. W. G. VanNunen May 1975 8 p refs Presented at the Flight Mech. Panel Symp. on Flight/Ground Testing Facilities Correlation, Valloire, France, 9-12 Jun. 1975

(NLR-MP-75020-U) Avail: NTIS HC $3.50

Some experimental methods applied at present to the measurements of unsteady derivatives are reviewed. They include the forced oscillation and free oscillation methods partly focused on the analysis of overall loads and moments acting on oscillating aircraft models. Further attention is paid to the measurement of unsteady pressure distribution as an alternative procedure to get information about derivatives; this technique is hardly to be considered as a substitute to the previous method, but may be suitable in the development and validation of analytical prediction methods. ESA

N76-22172# European Space Agency, Paris (France).

EXPERIMENTAL INVESTIGATION OF JET FLOW OVER AN AIRFOIL (COANDA EFFECT)

Hansgeorg Riedel Dec. 1975 73 p refs Transl. into ENGLISH of 'Exptl. Untersuch. der Strahlstroemung ueber ein Tragfluegelprofil (Coanda-Effekt)', DFVLR, Porz, West Ger. Report DLR-FB-73-98, 8 Aug. 1973 Original German report available from DFVLR, Porz, West Ger. DM 29.50

(ESA-TT-234; DLR-FB-73-98) Avail: NTIS HC $4.50

The properties and the behavior of the flow of a quasi two-dimensional jet over a curved surface were investigated with reference to an RAE 100 aerfoil of 25 % thickness-chord ratio. For the case of a turbulent jet of air discharged into the free atmosphere in the vicinity of the aerfoil main attention centered on the determination of the separation-flow reattachment characteristics of the aerfoil as well as the distribution of total and static pressure and of velocity in the flow field surrounding the aerfoil. Author (ESA)

N76-22173# European Space Agency, Paris (France).

THE EFFECTS OF GEOMETRIC PARAMETERS ON STATIC PRESSURE MEASUREMENTS IN A RAREFIED HYPERSONIC FLOW

K. Kienappel Feb. 1976 106 p refs Transl. into ENGLISH of 'Der Einfluss geometrischer Parameter auf die Messung des statischen Druckes in verduennter Hyperschallstroemung', DFVLR, Goettingen, West Ger. Report DLR-FB-73-41, 1973 Original German report available from DFVLR, Porz, West Ger. DM 36.90

(ESA-TT-266; DLR-FB-73-41) Avail: NTIS HC $5.50

The influence of the inclination and the diameter to length ratio of a pressure tap on the observed pressure was investigated experimentally in a rarefied hypersonic flow. The experiments were carried out on slender and blunt bodies utilizing the 2nd test section of a vacuum tunnel. The results were used to develop an empirical procedure for estimating the geometric effects on slender body pressure measurements. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N76-22174# Committee on Interstate and Foreign Commerce (U. S. House).

INTERNATIONAL AIR TRANSPORTATION COMPETITION

Washington GPO 1974 456 p refs Hearings on H.R. 14266, H.R. 13824, H.R. 14355, H.R. 14394, H.R. 14627, H.R. 14970, and H.Res. 1405 before Comm. on Interstate and Foreign Commerce and the Subcomm. on Transportation and Aeron., 93d Congr., 2d Sess., 25-26 Jun., 10-11 Jul., and 9 Oct. 1974

(GPO-37-626) Avail: Comm. on Interstate and Foreign Commerce

Amendments to the Federal Aviation Act which deal with discriminatory and unfair practices in international air transportation and provide financial assistance during the energy crisis to U.S. air carriers engaged in overseas and foreign air transportation are discussed. Alternatives to a fuel subsidy are considered. These include: positive revenue impact of a fare increase; potential downward effect on fuel prices of a proposed Federal Energy Office rule requiring increased refining of jet fuel and its price-controlled allocation to the international airlines; possible consolidation of North Atlantic service by Pan Am and TWA; and granting of new route authority by the CAB. J.M.S.

N76-22175*# Bell Helicopter Co., Fort Worth, Tex.

CONCEPTUAL DESIGN STUDY OF 1985 COMMERCIAL TILT ROTOR TRANSPORTS. VOLUME 3: STOL DESIGN SUMMARY Final Report

K. W. Sambell Washington Apr. 1976 97 p refs 4 Vol. (Contract NAS2-8259)

(NASA-CR-2690; D313-099-001-Vol-3) Avail: NTIS HC $5.00 CSCL 01C

A conceptual design study is presented of 1,985 commercial tilt rotor STOL transports for a NASA 200 n. mi. (370 km) STOL Mission. A 100-passenger STOL Variant (Bell D313) of the Phase I VTOL Tilt Rotor Aircraft is defined. Aircraft characteristics are given; with the aircraft redesigned to meet 2,000-foot (610 m) field criteria, with emphasis on low fuel consumption and low direct operating cost. The 100-passenger STOL Tilt Rotor Aircraft was analyzed for performance, weights, economics, handling qualities, noise footprint and aeroelastic stability. Author

N76-22176# European Space Agency, Paris (France).

CONTRIBUTION TO ROUTING AIRCRAFT AND TO THE ECONOMY OF AIR TRANSPORTATION

Hanns-Juergen Peters Dec. 1975 121 p refs Transl. into ENGLISH of 'Beitr. zum Netzumlauf von Flugzeugen u. zur Wirtschaftlichkeit des Flugbetriebs', DFVLR, Stuttgart Report DLR-FB-74-25, 1974 Original German report available from DFVLR, Porz, West Ger. DM 45

(ESA-TT-222; DLR-FB-74-25) Avail: NTIS HC $5.50

The cost estimation was separated from establishing aircraft rotation within an airline network. An effective procedure for routing aircraft is given, based on well known methods of operations research. The economics of aircraft operation is determined by applying Lufthansa and Lockheed methods. An equivalent interaction of both aspects of aircraft operation causes improved efficiency of air transportation. A proposed solution is applied to a regional airline system model, yielding quantitative results. Author (ESA)

N76-22177# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Zentralabteilung Luftfahrttechnik.

AIRWORTHINESS AND SAFETY REGULATIONS FOR CIVIL AND MILITARY AIRCRAFT IN PARTICULAR FOR VSTOL AND STOL AIRCRAFT [ZIVILE UND MILITAERISCHE LUFTTUECHTIGKEITS- UND SICHERHEITS-VORSCHRIFTEN, IM BESONDEREN FUER VSTOL- UND STOL-FLUGZEUGE]

K. Wagner Feb. 1974 37 p refs In GERMAN
(DLR-IB-555-74/1) Avail: NTIS HC $4.00

Regulations for aircraft in general and Powered Lift Aircraft (PLA) in particular are reviewed. The concepts of quality assurance and airworthiness are discussed as well as airworthiness regulations and recommendations of PLA, with particular reference to US-MIL-SPEC. Airworthiness recommendations and/or considerations for PLA - VSTOL and STOL - for in-flight operations are dealt with. A literature review is given. ESA

N76-22178# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Zentralabteilung Luftfahrttechnik.

RELATIONS BETWEEN SAFETY, RELIABILITY, MAINTENANCE, AND MAINTAINABILITY [ZU DEN VERKNUEPFUNGEN VON SICHERHEIT, ZUVERLAESSIGKEIT, INSTANDHALTUNG UND INSTANDHALTBARKEIT]

K. Wagner Nov. 1974 11 p refs In GERMAN
(DLR-IB-555-74/7) Avail: NTIS HC $3.50

The interdependence of various features of equipment is outlined. Topics dealt with briefly are relationships between safety and reliability; relationships between maintenance and safety and reliability; and, finally, the relationships with maintainability. It is concluded that the design engineer and manufacturer should take the abovementioned factors into consideration in designing equipment. An example is given for an aircraft with an engine failure. ESA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N76-22179*# Analytical Mechanics Associates, Inc., Jericho, N.Y.

SIMULATION, GUIDANCE AND NAVIGATION OF THE B-737 FOR ROLLOUT AND TURNOFF USING MLS MEASUREMENTS

S. Pines, S. F. Schmidt, and F. Mann 8 Dec. 1975 68 p refs
(Contract NAS1-13746)
(NASA-CR-144959; AMA-75-40) Avail: NTIS HC $4.50 CSCL 17G

A simulation program is described for the B-737 aircraft in landing approach, a touchdown, rollout and turnoff for normal and CAT III weather conditions. Preliminary results indicate that microwave landing systems can be used in place of instrument landing systems landing aids and that a single magnetic cable can be used for automated rollout and turnoff. Recommendations are made for further refinement of the model and additional testing to finalize a set of guidance laws for rollout and turnoff. Author

N76-22180*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

RELATIVE EFFECTIVENESS OF SEVERAL SIMULATED JET ENGINE NOISE SPECTRAL TREATMENTS IN REDUCING ANNOYANCE IN A TV-VIEWING SITUATION

Walter J. Gunn, Tsuyoshi Shigehisa, and William T. Shepherd (FAA, Washington, D. C.) Apr. 1976 47 p refs
(NASA-TM-X-72828) Avail: NTIS HC $4.00 CSCL 05E

An experiment was conducted in order to determine the relative effectiveness of several hypothetical jet engine noise treatments and to test hypothesis that speech interference, at least in part, mediates annoyance in a TV-viewing situation. Twenty-four subjects watched television in a simulated living room. Recorded jet flyover noises were presented in such a way as to create the illusion that aircraft were actually flying overhead. There were 27 stimuli (nine spectra at three overall levels) presented at an average rate of approximately one flight every 2 minutes. Subjects judged the annoyance value of individual stimuli using either a category rating method or magnitude estimation method in each of two 1-hour sessions. The spectral treatments most effective in reducing annoyance were at 1.6 Khz and 800 Hz, in that order. The degree of annoyance reduction resulting from all treatments was affected by the overall sound level of the stimuli, with the greatest reduction at the intermediate overall sound level, about 88 to 89 db(A), peak value. The results are interpreted as supporting the hypothesis that speech interference, at least in part, mediates annoyance with aircraft noise in a TV-viewing situation. Author

N76-22181# Avcon Universal Consultants Corp., Baden, Pa.

PROCESSING INSTRUMENT APPROACH DATA FOR MICROWAVE LANDING SYSTEM IMPLEMENTATION Final Report

Thomas L. Croswell Jun. 1975 67 p refs
(AD-A019762/4; AV-MLS-74-2; FAA-RD-74-182) Avail: NTIS HC $4.50 CSCL 17/7

Computer programs developed for application to microwave landing system implementation planning are described. The data sources, programs and applications, reference documentation for the programs developed, and a training guide and applications manual for these programs are discussed. Author

N76-22182# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

A CLASS OF RELIABILITY CHARACTERISTICS WITH APPLICATION TO DATA ON FAILURES OF AN INERTIAL NAVIGATION SYSTEM

T. J. Burgerhout and J. Simons 12 Jun. 1975 31 p refs Submitted for publication
(NLR-MP-75024-U) Avail: NTIS HC $4.00

The class of characteristics developed is based on relatively simple but rather general assumptions with respect to the influence of the quality of the apparatus (the internal stress) and of the external circumstances (the external stress) on the appearance of failures. The class contains the Poisson characteristics as a limit case. The derived characteristics can practically not be discerned from a set of Weibull characteristics. The developed specimens were applied to the description of the reliability characteristics of an inertial navigation system. For a reliability analysis, which includes separate investigation of the quality of the apparatus used and of the influence of external stress, the data collection of times between failures during a field experiment has to be supplemented by a data collection during a laboratory experiment under exclusion of the external stress. For the case that both data collections are available and that the observations are made under the assumed conditions, a definition is given for the acceptability of the apparatus used for the given task and a test is provided for the investigation of this acceptability. Author (ESA)

N76-22183# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services and Special Projects Div.

A SLOTTED WAVEGUIDE ANTENNA AS A MARKER BEACON FOR AIRCRAFT

O. B. M. Pietersen and F. Klinker 1 Jul. 1975 15 p refs Presented at the IEEE/AP-S-Intern. Symp., Urbana, Ill., 2-5 Jun. 1975
(NLR-MP-75027-U) Avail: NTIS HC $3.50

A position marker system used in aircraft certification flights is described. The system consists of a ground-based part, viz, a microwave transmitter and a fan-beam antenna, and an airborne part composed of receiving antenna, a crystal-video receiver, and a processor which interfaces the system to the usual recording equipment. The design of the fan-beam antenna is stressed since the performance of the system depends heavily on it. Some measurement results of the antenna are given. It is shown that the slotted waveguide antenna, fed in the center and used in difference mode, is suitable as a marker beacon for aircraft. For heights less than 1,000 m, the aircraft position can be determined (in one dimension) with an accuracy of a few meters. Author (ESA)

N76-22184# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.

A MATHEMATICAL MODEL FOR THE ANALYSIS OF NAVIGATION SYSTEM ERRORS OF MODERN FIGHTER AIRCRAFT

F. J. Abbink and N. VanDriel 11 Aug. 1975 12 p refs Presented at the AGARD Avionics Panel 30th Tech. Meetings on Medium Accuracy Low Cost Navigation, Sandefjord, Norway, 7-12 Sep. 1975

(NLR-MP-75029-U) Avail: NTIS HC $3.50

The model, for analysis of an inertial navigation system using dead reckoning and fixing navigation sensors, is described and developed for simulation on a digital computer. In order to compute the standard deviations of the navigation system errors, the matrix equation representing the set of linearized differential equations for the navigation system error behavior is transformed into an evolution equation for the covariance matrix. The navigation system error model takes into account, alignment, navigation along a specific flight profile, and updating. Position error distribution was calculated and analyzed for different flight profiles, with and without updating for a specific type of inertial navigation system. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N76-22185*# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.

FLIGHT TEST EVALUATION OF A METHOD TO DETERMINE THE LEVEL FLIGHT PERFORMANCE PROPELLER-DRIVEN AIRCRAFT Semiannual Progress Report, Oct. - Mar. 1976

Ernest J. Cross, Jr. Mar. 1976 58 p

(Grant NsG-1231)

(NASA-CR-147092) Avail: NTIS HC $4.50 CSCL 01C

A procedure is developed for deriving the level flight drag and propulsive efficiency of propeller-driven aircraft. This is a method in which the overall drag of the aircraft is expressed in terms of the measured increment of power required to overcome a corresponding known increment of drag. The aircraft is flown in unaccelerated, straight and level flight, and thus includes the effects of the propeller drag and slipstream. Propeller efficiency and airplane drag are computed on the basis of data obtained during flight test and do not rely on the analytical calculations of inadequate theory. Author

N76-22186*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRANSONIC LATERAL AND LONGITUDINAL CONTROL CHARACTERISTICS OF AN F-8 AIRPLANE MODEL EQUIPPED WITH AN OBLIQUE WING

Ronald C. Smith, Robert T. Jones, and James L. Summers Mar. 1976 295 p refs

(NASA-TM-X-73103; A-6434) Avail: NTIS HC $9.25 CSCL 01C

The aerodynamic stability and control characteristics of a 0.087-scale model of an F-8 airplane fitted with an oblique wing was studied. The wing had an elliptical planform (axis ratio = 8:1), a maximum thickness of 12 percent, and was tested at three sweep angles, 0, 45, and 60 deg. Six-component force and moment data were measured at zero sideslip for angles of attack between -6 and +16 deg, with the left and right ailerons deflected one at a time at angles between -14 deg and +14. Further tests were made with the horizontal tail deflected -5 and +2.5 deg. Test Mach numbers ranged from 0.6 to 1.4 at a Reynolds number of 20 million/m. Author

N76-22187*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LOW-SPEED WIND-TUNNEL TESTS OF A LARGE SCALE BLENDED ARROW ADVANCED SUPERSONIC TRANSPORT MODEL HAVING VARIABLE CYCLE ENGINES AND VECTORING EXHAUST NOZZLES

Lysle P. Parlett and James P. Shivers Apr. 1976 57 p refs

(NASA-TM-X-72809) Avail: NTIS HC $4.50 CSCL 01C

A low-speed wind-tunnel investigation was conducted in a full-scale tunnel to determine the performance and static stability and control characteristics of a large-scale model of a blended-arrow advanced supersonic transport configuration incorporating variable-cycle engines and vectoring exhaust nozzles. Configuration variables tested included: (1) engine mode (cruise or low-speed), (2) engine exit nozzle deflection, (3) leading-edge flap geometry, and (4) trailing-edge flap deflection. Test variables included values of C sub micron from 0 to 0.38, values of angle of attack from -10 degrees to 30 degrees, values of angle of sideslip, from -5 degrees to 5 degrees, and values of Reynolds number, from 3.5 million to 6.8 million. Author

N76-22188*# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

AUTOMATED WING STRUCTURAL DESIGN Final Technical Report

Raphael T. Haftka Nov. 1975 12 p refs

(Grant NGR-52-012-008)

(NASA-CR-147142) Avail: NTIS HC $3.50 CSCL 01A

Research on the optimization of wing structures under multiple constraint such as strength, displacement, buckling, flutter, and divergence limits is reported. Advances were made in improving mathematical programming techniques as well as in improving the efficiency of constraint calculation. The WIDOWAC (Wing Design Optimization With Aeroelastic Constraints) computer program served as the main vehicle for this research. The methods developed were implemented in a general user oriented finite element program. Author

N76-22189*# Transemantics, Inc., Washington, D.C.

MECHANICAL FLAPS Progress Report

P. Perrier and M. Lavenant Washington NASA Feb. 1976 38 p refs Transl. into ENGLISH from AGARD Report AGARD-AP-133, Oct. 1974

(Contract NASw-2792)

(NASA-TT-F-16875; AGARD-AP-133) Avail: NTIS HC $4.00 CSCL 01C

A wing with powerful mechanical high lift devices was designed with a combined use of theoretical aerodynamic methods and practical experience gained in the development of advanced mechanical systems. Wind tunnel tests, on a complete model, confirmed that this type of high lift schemer is a serious candidate for R/STOL aircraft applications. Author

N76-22190# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Zentralabteilung Luftfahrttechnik.

TYPICAL FLIGHT TESTS TO ESTABLISH THE PERFORMANCE OF THE LOCKHEED T 33 A AIRCRAFT [TYPISCHE FLUGVERSUCHE ZUR LEISTUNGSERMITTLUNG MIT DEM FLUGZEUG LOCKHEED T 33 A]

H. Galleithner Dec. 1974 87 p refs In GERMAN

(DLR-IB-555-74/12) Avail: NTIS HC $5.00

Performance was determined from five typical flight tests. The theoretical background, experimental procedure, evaluation, and results of the flight tests are presented: static pressure calibration from flights past a tower; required thrust; flow breaking; climbing flight law; and turning flight performance in horizontal flights. ESA

N76-22191# European Space Agency, Paris (France).

YAK 40 COCKPIT SYSTEM STUDY. A PILOT OPINION SURVEY OF THE AIRCRAFT HANDLING AND SYSTEM QUALITIES

Konrad Steininger, Guenter Neumann et al Feb. 1976 56 p refs Transl. into ENGLISH of 'Cockpit-Systemstudie YAK 40. Beurteilung der Cockpiteinrichtungen, Flug- u. Systemeigenschaften des Flugzeugmusters durch Piloten', DFVLR, Bonn Report DLR-FB-75-15, 2 Jan. 1975 Original German report available from DFVLR, Porz, West Ger. DM 24.90

(ESA-TT-259; DLR-FB-75-15) Avail: NTIS $4.50

A representative sample of pilots employed with an airline operating the Russian short haul jet transport aircraft YAK 40 assessed the acceptability of the cockpit layout and instrumentation, the handling quality, and the feasibility of the systems with regard to the pilot's workload. The assessment of the concerned

qualities was quantitatively conducted by using a 7-scale rating of 82 items of a questionnaire, and qualitatively by tape-recorded descriptions of critical experiences with the aircraft. This method of subjective assessment, rating, and description of a system has some justification in finding out both the critical weakness and the favorable points of an aircraft operation. It is a heuristic approach toward a direct recognition of the particular kind of strain involved and attention needed to cope with that aircraft operation. Author (ESA)

N76-22192# Technology, Inc., Dayton, Ohio. Instruments and Controls Div.
DEVELOPMENT OF RMS COST MODEL AND DEMONSTRATION OF ALTERNATIVE OH-58 MAINTENANCE SCENARIOS Final Report, Jun. 1974 - Nov. 1975
Larry E. Clay and James E. Kirchmer Jul. 1975 77 p refs
(Contract DAAJ01-74-C-0839)
(AD-A017760; TI-069220-75-06; USAAVSCOM-TR-75-27) Avail: NTIS CSCL 01/3

For several years, the Army has employed the Reliability and Maintainability Simulator (RMS) computer program to simulate the operation and maintenance of helicopter fleets of up to 24 aircraft. However, since the basic RMS model did not include cost information, the economic consequences of changes in the maintenance procedures could not be projected, and the cost effectiveness of contemplated reliability improvements could not be evaluated. Consequently, to remedy these deficiencies, the RMS model was revised and expanded to an RMS COST model by adding a cost computation to determine all operating and maintenance costs during the simulation period. The resultant RMS COST model was demonstrated by executing a simulation of an OH-58 helicopter company with a baseline mission and maintenance system scenario and then with six alternative scenarios. GRA

N76-22193# Technology, Inc., Dayton, Ohio. Instruments and Controls Div.
RMS COST MODEL USER'S MANUAL Final Report, Jun. 1974 - Nov. 1975
James E. Kirchmer Sep. 1975 120 p
(Contract DAAJ01-74-C-0839)
(AD-A017761; USAAVSCOM-TR-75-28) Avail: NTIS CSCL 01/3

This manual provides a detailed description of the cost input required to operate the RMS Cost model; the descriptions, flow-charts and source listings for the operation and maintenance cost computation subroutines; a complete source listing of the RMS Cost program with annotations for RMS code modifications; and a sample of the cost-information tables. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N76-22194# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
COMPARATIVE STUDY OF MULTIPLEX SIGNAL TRANSMISSION ONBOARD AIRCRAFT USING CABLES OR FIBER OPTICS M. S. Thesis - Tech. Univ. Munich
Karl-Friedrich Finke 22 May 1974 101 p refs In GERMAN; ENGLISH summary
(MBB-UFE-1098-0) Avail: NTIS HC $5.50

Principles and problems of data transfer via electric cables, including trunk groups, as well as via optical fibers, are investigated. The principal layout of data buses, both via cable and optical fiber, as a transmission medium, is described and disadvantages of present data buses for aircraft are pointed out. A plan is developed for an onboard data bus-system. The potential realizations of such a system, applying cable and optical fiber technology, are discussed and compared with each other. As a result of these considerations, a proposal is presented for such a system using fiber optics technology. Author (ESA)

N76-22195# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
A SIMULATOR EXPERIMENT TO INVESTIGATE A LATERAL RATE FIELD DISPLAY
P. H. Wewerinke 14 Jun. 1974 48 p refs
(NLR-TR-74093-U) Avail: NTIS HC $4.00

To assess the use of linear rate field displays with respect to their alerting, directing, and tracking functions the results of an experimental program in a realistic task situation, namely, a lateral position control task in the presence of lateral gust disturbances for a Fighter aircraft, are presented. Two displays are included in the experimental setup: a three-axis attitude direction indicator and a cross track rate display. Various formats were investigated. The status display configurations are compared with a flight director configuration whose design is briefly described and based on modern manual control theory. Experimental results reveal that the flight director configuration is superior to the status display configuration both in terms of system performance and pilot workload. Furthermore, it is apparent from the results that rate information is useful for the task considered. When provided by means of a moire' pattern this information can be derived peripherally, which is important for high visual input load situations. The use of a secondary workload task is demonstrated and modifications are suggested. Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N76-22196 Cornell Univ., New York.
SONIC BOOMS OF DRAG DOMINATED HYPERSONIC VEHICLES Ph.D. Thesis
Bernard Tiegerman 1975 387 p
Avail: Univ. Microfilms Order No. 76-8156

Certain features of the sonic booms produced by drag-dominated hypersonic vehicles, while in flight in a homogeneous and a isothermal atmosphere, are investigated. The flow field about a simple, drag dominated hypersonic vehicle is considered, because this flow field is assumed to illuminate the general features of the flow pattern about a drag dominated hypersonic airplane, or projectile. The sonic boom produced by a model of this simple vehicle is determined. The results are used to predict the overpressures, the positive-phase durations, and the positive-phase impulses, of the sonic booms generated by Apollo space vehicles during their reentries into the earth's atmosphere.
Dissert. Abstr.

N76-22197*# Pratt and Whitney Aircraft, East Hartford, Conn.
STUDY OF TURBOFAN ENGINES DESIGNED FOR LOW ENERGY CONSUMPTION Final Report
D. E. Gray Apr. 1976 119 p refs
(Contract NAS3-19132)
(NASA-CR-135002; PWA-5318) Avail: NTIS HC $5.50 CSCL 21E

The near-term technology improvements which can reduce the fuel consumed in the JT9D, JT8D, and JT3D turbofans in commercial fleet operation through the 1980's are identified. Projected technology advances are identified and evaluated for new turbofans to be developed after 1985. Programs are recommended for developing the necessary technology. Author

N76-22198*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPLASH GROOVE FUEL INJECTOR Patent Application
Robert D. Ingebo and Carl T. Norgren, inventors (to NASA) Filed 7 Apr. 1976 16 p
(NASA-Case-LEW-12417-1; US-Patent-Appl-SN-674340) Avail: NTIS HC $3.50 CSCL 21E

A patent application relative to a new type of fuel injector,

suitable for use on advanced high-pressure and high-temperature turbojet engines, was presented. This injector distributes the fuel spray more uniformly across the complete combustor-annulus cross-section, is more reliable in performance, particularly with respect to the usage of contaminated fuels, and requires a lower pressure to maintain the desired fuel atomization. It comprises an element having several grooves of successively reduced diameters, each of which provides pairs of circular lips. A plurality of circularly symmetrical apertures is arranged to receive and discharge the fuel from exit orifices facing the lip from the surface in a radial plane of the second, adjacent lip of the pair. Y.J.A.

N76-22199*# Purdue Univ., Lafayette, Ind. Thermal Sciences and Propulsion Center.

TURBINE VANE GAS FILM COOLING WITH INJECTION IN THE LEADING EDGE REGION FROM A SINGLE ROW OF SPANWISE ANGLED HOLES Final Report, Feb. 1972 - Jul. 1975

Mel R. Lecuyer and Gary J. Hanus Apr. 1976 337 p refs Submitted for publication

(Grant NGR-15-005-147)

(NASA-CR-147160; TSPC-TR-76-1) Avail: NTIS HC $10.00 CSCL 21E

An experimental study of gas film cooling was conducted on a 3X size model turbine vane. Injection in the leading edge region was from a single row of holes angled in a spanwise direction. Measurements of the local heat flux downstream from the row of coolant holes, both with and without film coolant flow, were used to determine the film cooling performance presented in terms of the Stanton number ratio. Results for a range of coolant blowing ratio, M = 0 to 2.0, indicate a reduction in heat flux of up to 15 to 30 percent at a point 10 to 11 hole diameters downstream from injection. An optimum coolant blowing ratio corresponds to a coolant-to-freestream velocity ratio in the range of 0.5. The shallow injection angle resulted in superior cooling performance for injection closest to stagnation, while the effect of injection angle was insignificant for injection further from stagnation. Author

N76-22200*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

BLADE ROW DYNAMIC DIGITAL COMPRESSOR PROGRAM. VOLUME 1: J85 CLEAN INLET FLOW AND PARALLEL COMPRESSOR MODELS

W. A. Tesch and W. G. Steenken Mar. 1976 218 p refs (Contract NAS3-18526)

(NASA-CR-134978; R75AEG406) Avail: NTIS HC $7.75 CSCL 21E

The results are presented of a one-dimensional dynamic digital blade row compressor model study of a J85-13 engine operating with uniform and with circumferentially distorted inlet flow. Details of the geometry and the derived blade row characteristics used to simulate the clean inlet performance are given. A stability criterion based upon the self developing unsteady internal flows near surge provided an accurate determination of the clean inlet surge line. The basic model was modified to include an arbitrary extent multi-sector parallel compressor configuration for investigating 180 deg 1/rev total pressure, total temperature, and combined total pressure and total temperature distortions. The combined distortions included opposed, coincident, and 90 deg overlapped patterns. The predicted losses in surge pressure ratio matched the measured data trends at all speeds and gave accurate predictions at high corrected speeds where the slope of the speed lines approached the vertical. Author

N76-22201*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SPECTRAL RADIANCE MEASUREMENTS AND CALCULATED SOOT CONCENTRATIONS ALONG THE LENGTH OF AN EXPERIMENTAL COMBUSTOR

Carl T. Norgren and Robert D. Ingebo Washington Apr. 1976 26 p refs

(NASA-TM-X-3394; E-8630) Avail: NTIS HC $4.00 CSCL 21E

Radiometric data were obtained over a range of parametric test conditions at three positions along the length of an experimental combustor segment corresponding to the primary, intermediate, and dilution zones. The concentration of soot entrained in the combustion gases was calculated by a technique using spectral radiance measurements. Tests were conducted primarily with Jet A fuel, although limited data were taken with two fuels having higher aromatic content, diesel oil number 2 and a blend of 40 percent tetralin in Jet A fuel. Radiometric observation of the combustion gases indicated that the maximum total radiance peaked at the intermediate zone, which was located immediately upstream of the dilution holes. Soot concentrations calculated from optical measurements in the dilution zone compared favorably with those obtained by in situ gas sampling at the exhaust. The total radiance increased with the higher aromatic content fuels. Author

N76-22202* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

TWO DIMENSIONAL WEDGE/TRANSLATING SHROUD NOZZLE Patent Application

Donald L. Maiden, inventor (to NASA) Filed 31 Mar. 1976 18 p

(NASA-Case-LAR-11919-1; US-Patent-Appl-SN-672221) Avail: NTIS HC $3.50 CSCL 21E

A jet propulsion exhaust nozzle particularly useful in multi-engine installations is described. The exhaust nozzle provides high internal/external, thrust-minus-drag, performance for transonic cruise or transonic acceleration as well as improved performance at subsonic and supersonic speeds. A two dimensional wedge/translating shroud at the nozzle exit gives the variable nozzle exit geometry needed to achieve high engine performance over a wide range of throttle power settings. NASA

N76-22203# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Zentralabteilung Luftfahrttechnik.

SOUND ATTENUATOR FOR DO 27 [SCHALLDAEMPFER FUER DO 27]

K. Seifert Jul. 1974 21 p In GERMAN

(DLR-IB-555-74/4) Avail: NTIS HC $3.50

Two sound attenuators for the engine of the relatively noisy DO 27 H and DO 27 A aircraft were constructed and tested in an anechoic chamber. The choice of a combined attenuator, consisting of a resonator and absorption part, containing a pipe lining and a muffler, is discussed. The flight noise of the DO 27 H is dealt with and the dimensions of the sound attenuator are detailed. Measuring equipment and measuring results are discussed; it is concluded that the level of attenuation reached will probably be sufficient. ESA

N76-22204# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Zentralabteilung Luftfahrttechnik.

NOISE LEVEL MEASUREMENTS IN COCKPITS AND CABINS OF DFVLR, OBERPFAFFENHOFEN FLIGHT UNIT AIRCRAFT (RESULTS OF A FIRST SERIES OF MEASUREMENTS) [SCHALLPEGELMESSUNGEN IN COCKPIT UND KABINE VON FLUGZEUGEN DER DFVLR-FLUGBEREITSCHAFT OBERPFAFFENHOFEN (ERGEBNISSE EINER ERSTEN MESSREIHE)]

H. Galleithner Dec. 1974 20 p In GERMAN

(DLR-IB-555-74/11) Avail: NTIS HC $3.50

The noise, at car level, of Dornier DO 27 and 28, Beech 65, Piaggio Pi 149 D and Cessna 207 aircraft was measured during typical flight phases on the runway, during takeoff, and during cruising. Results were tabulated. It is shown that the noise level of the different aircrafts can be classified, transforming the dB (A)-level into a dimensionless characteristic performance number, which is a measure for the effective engine performance as a percentage of the continuous performance. ESA

N76-22205# Solar, San Diego, Calif.

CONTINUED TESTING: MERDC ROTATING DIFFUSER COMPRESSOR Engineering Report

Colin Rodgers Nov. 1974 39 p

(Contract DAAK02-71-C-0466)

(AD-A018160; ER-2504) Avail: NTIS CSCL 21/5

This report documents the results of continued performance evaluation on an experimental high pressure ratio, single stage, centrifugal compressor. A rotating vaneless/vaned diffuser is

incorporated. The reduced test data and overall performances of Builds 4, 5 and 6 with revised diffuser configurations are presented. GRA

N76-22206# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TURBOFAN CYCLE, PERFORMANCE AND DESIGN ANALYSIS
T. Etlik, Z. Masek, Z. Pospisil, and M. Simer 20 Mar. 1975 32 p refs Transl. into ENGLISH from Vyzkumny a Zkusebni Letecky Ustav, Letnany. Zpravodaj Vzlu (Czechoslovakia), no. 3(93), 1972 p 43-56
(AD-A017798; FTD-HC-23-0973-75) Avail: NTIS CSCL 21/5

A turbofan cycle analysis has been carried out to predict the effect of cycle independent variables e.g. compressor pressure ratio, bypass ratio, fan pressure ratio and turbine entry temperature - on specific fuel consumption. Influence of these variables on engine performance for different flight conditions and engine ratings has been shown. GRA

N76-22207# McDonnell-Douglas Research Labs., St. Louis, Mo.
EVALUATION OF EXPERIMENTS USING ELECTROSTATIC PROBES TO DETECT IMMINENT FAILURE OF JET ENGINE GAS-PATH COMPONENTS Final Report, 1 Apr. 1974 - 31 Mar. 1975
Miklos Sajben, Tzy C. Peng, and John F. Shaeffer Jul. 1975 158 p refs
(Contract F33615-74-C-3091; AF Proj. 1987)
(AD-A017738; AFFDL-TR-75-74) Avail: NTIS CSCL 21/5

Electrostatic probes placed in jet engine exhausts were found to display current signal pulses ('spikes') in an apparently random fashion. In some tests, where a failure of some engine component occurred, the frequency of the pulses was observed to increase by orders of magnitude prior to the failure. A tentative explanation attributed these pulses to impacts of engine distress-produced particulate matter on the probe. This phenomenon offers promise for the development of a device capable of alerting pilots to an imminent engine failure. The implementation of such a system, however, is not feasible without understanding the physical mechanisms linking the spikes to failure. This report is an evaluation of a considerable body of related experimental information. The study shows that most of the spikes are corona discharges between the probe and concentrations of ionic or particulate charges ('charged clouds'), convected with the exhaust gas. GRA

N76-22208# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COOLED HOLLOW BLADE OF A TURBOMACHINE
S. Z. Kopelev, M. V. Avilova-Shulagina, S. V. Gurov, K. Andronov, and P. S. Fedorov 5 May 1975 9 p Transl. into ENGLISH from Russian Patent no. 208383 (22 Jul. 1968) 2 p
(AD-A018258; FTD-ID(RS)I-1272-75) Avail: NTIS CSCL 21/5

An air cooled hollow burbine blade design is described. The bridges are made on the form of curved streamline profiles which form channels. The proposed design increases cooling intensity and the strength of the trailing edge. J.M.S.

N76-22209# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COOLED TURBO-MACHINE BLADE
K. M. Popov 30 Apr. 1975 9 p Transl. into ENGLISH from Russian Patent no. 294016, 26 Jan. 1971
(AD-A018257; FTD-ID(RS)I-1271-75) Avail: NTIS CSCL 21/5

A gas turbine blade design which improves cooling is described. The power rod is joined to the envelope with bridges that are staggered and form transverse winding channels for the coolants passage, with a subsequent discharge through holes in the trailing edge. Ribs are placed along the leading edge on the internal surface of the envelope. J.M.S.

N76-22210# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COOLED TURBOENGINE VANE
V. A. Kurganov 30 Apr. 1975 6 p Transl. into ENGLISH from Russian Patent no. 345282, 14 Jul. 1972 p 1-2
(AD-A018256; FTD-ID(RS)I-1270-75) Avail: NTIS CSCL 21/5

A gas turbine blade design is described. The deflector has bridges in the output edge zone which form a turbulizing lattice for the purpose of more efficient cooling. J.M.S.

N76-22211# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HIGH-TEMPERATURE GAS TURBINE BLADE
E. P. Dyban and A. I. Mazur 7 May 1975 10 p Transl. into ENGLISH from Russian Patent no. 245497, 9 Feb. 1972
(AD-A018255; FTD-ID(RS)I-1269-75) Avail: NTIS CSCL 21/5

A gas turbine blade is proposed in which the deflector has units with intercepting plates which form channels for the jet distribution of air, while the outlet serves as the trailing edge of the blade, protected by an air film. The proposed design improves cooling of the blade. J.M.S.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N76-22212# Bristol Univ. (England). Dept. of Aeronautical Engineering.
SOME EXPLORATORY STUDIES ON A PILOT'S AGGRAVATION OF AIRCRAFT RESPONSE TO ATMOSPHERIC TURBULENCE
M. G. Anthony, D. L. Birdsall, and R. Stirling Apr. 1974 30 p refs
(Grant SRC-B/SR/8168.6)
Avail: NTIS HC $4.00

The pilot's contribution to maintenance of control or to recovery when control has been lost during atmospheric turbulence flight of a jet transport was assessed. A transient record of atmospheric turbulence excites a longitudinal simulation of a large (rigid) jet transport while several dynamic parameters are recorded. A linear pilot model is allowed to respond to the pitch rate and load factor at the cockpit, producing a column deflection for a range of pilot sensitivities and his delay. Two mechanisms for control are connected to the column, namely the conventional elevator and a trailing-edge high-speed flap subject to washout. It is shown that, subject to a number of simplifying assumptions, a very limited range of the sensitivities and delay will lead to an improvement in the pilot's ride. The safety of passengers elsewhere is to be questioned as the ride quality at aft stations can be seriously degraded by pilot action. Author (ESA)

N76-22213# European Space Agency, Paris (France).
METHODS FOR PARAMETER INSENSITIVE CONTROL SYSTEM DESIGN WITH APPLICATION TO A CONTROL CONFIGURED VEHICLE (CCV)
Gerd Hirzinger and Gerhard Kreisselmeier Dec. 1975 182 p refs Transl. into ENGLISH of 'Methoden zur Auslegung eines parameterunempfindlichen Regelungssystems u. ihre Anwend. fuer ein aerodynamisch instabiles Flugzeug (CCV)', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-FB-75-40, 21 May 1975 Original German report available from DFVLR, Cologne DM 56.80
(ESA-TT-225; DLR-FB-75-40) Avail: NTIS HC $7.50

Methods for the design of the systems are applied to control longitudinal motion (flight path control). For nominal flight conditions the controller design is simplified by introducing reference trajectories and optimizing over the controller coefficients. While nominal control system properties are maintained, its sensitivity with respect to plant parameter variations is reduced in a direct way by suitable readjustment of the controller structure and/or controller coefficients. Detailed simulation results illustrate the properties of the different control system designs. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N76-22214*# TRW Systems Group, Redondo Beach, Calif. Chemical Physics Group.
RESEARCH INVESTIGATION OF THE PHYSICAL INTERACTIONS AND PHENOMENA ASSOCIATED WITH HYPERVELOCITY SUB-MICRON PARTICLES Final Report
N. L. Roy Jul. 1975 67 p refs
(Contract NASw-2720)
(TRW-27207-6001-TU-00; NASA-CR-147217) Avail: NTIS HC $4.50 CSCL 14B

Signals from impact ionization plasmas were studied as a means of performing microparticle composition analysis. Impact ionization signal response was measured in a time-of-flight (TOF) system for lanthanum hexaboride, carbonyl iron, and aluminum microparticle impacts on a tantalum target, primarily in the 1 - 8 km/s velocity range. Oscilloscope photographs of representative ion TOF signal response are given for each material studied. Graphs and histograms are presented of the total charge collected as well as the charge collected in each observed ion mass group. Data show that ion signals consist primarily of the lower ionization potential elements over the 1 - 8 km/s range. Author

N76-22215*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
ON SOME FUNDAMENTAL PROBLEMS PERTAINING TO A TRANSONIC INDUCTION-DRIVEN GUST WIND TUNNEL DESIGN
P. Carriere Washington NASA Apr. 1976 22 p refs Transl. into ENGLISH from Rheinisch-Westfalische Tech. Hochschule, Aerodynamics Inst. (West Germany), no. 22, 1975 p 226-232
(Contract NASw-2789)
(NASA-TT-F-16976) Avail: NTIS HC $3.50 CSCL 14B

It is shown that performance criteria dominate the possibilities of application and specifications of transonic induction-driven gust wind tunnels. These criteria relate to the performance of the injectors used for the induction process, to the optimization of the evacuation system, and to wind tunnel starting processes. The major remaining problem is to construct a transonic wind tunnel which simultaneously satisfies conditions of noninteraction and of minimal acoustic perturbation, and shock waves. Flow calculations that were used in the optimization of wind tunnel systems are shown. Author

N76-22216*# Southern Methodist Univ., Dallas, Tex.
TECHNOLOGY AND POLITICS: THE REGIONAL AIRPORT EXPERIENCE
Jay D. Starling, James Brown, James M. Gerhardt, and Marc I. Dominus May 1976 155 p refs
(Grant NsG-2006)
(NASA-CR-147159) Avail: NTIS HC $6.75 CSCL 01E

The findings of a comparative study of the following six regional airports were presented: Dallas/Fort Worth, Kansas City, Washington, D.C., Montreal, Tampa, and St. Louis. Each case was approached as a unique historical entity, in order to investigate common elements such as: the use of predictive models in planning, the role of symbolism to heighten dramatic effects, the roles of community and professional elites, and design flexibility. Some of the factors considered were: site selection, consolidation of airline service, accessibility, land availability and cost, safety, nuisance, and pollution constraints, economic growth, expectation of regional growth, the demand forecasting conundrum, and design decisions. The hypotheses developed include the following: the effect of political, social, and economic conflicts, the stress on large capacity and dramatic, high-technology design, projections of rapid growth to explain the need for large capital outlays. Y.J.A.

N76-22217*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESIGN AND PRELIMINARY TEST RESULTS AT MACH 5 OF AN AXISYMMETRIC SLOTTED SOUND SHIELD
Ivan E. Beckwith, Andrew J. Spokowski, William D. Harvey, and P. Calvin Stainback Jun. 1975 64 p refs
(NASA-TM-X-72679) Avail: NTIS HC $4.50 CSCL 14B

The basic theory and sound attenuation mechanisms, the design procedures, and preliminary experimental results are presented for a small axisymmetric sound shield for supersonic wind tunnels. The shield consists of an array of small diameter rods aligned nearly parallel to the entrance flow with small gaps between the rods for boundary layer suction. Results show that at the lowest test Reynolds number (based on rod diameter) of 52,000 the noise shield reduced the test section noise by about 60 percent (or 8 db attenuation) but no attenuation was measured for the higher range of test reynolds numbers from 73,000 to 190,000. These results are below expectations based on data reported elsewhere on a flat sound shield model. The smaller attenuation from the present tests is attributed to insufficient suction at the gaps to prevent feedback of vacuum manifold noise into the shielded test flow and to insufficient suction to prevent transition of the rod boundary layers to turbulent flow at the higher Reynolds numbers. Schlieren photographs of the flow are shown. Author

N76-22218*# Computer Sciences Corp., Mountain View, Calif.
A SINGLE AXIS STUDY OF FLIGHT SIMULATOR KINEMATICS BY DIFFERENCE TECHNIQUES
Larry D. Webster Apr. 1976 47 p
(Contract NAS2-7806)
(NASA-CR-137860) Avail: NTIS HC $4.00 CSCL 14B

The kinematic parameters of position, velocity, and acceleration of a flight simulator may be calculated by knowing the distance between two or more points on an axis and the time the simulator takes to traverse the space between each set of points. These parameters are calculated through the use of difference techniques. Given the true kinematic response of the simulator to computer generated commands, the entire motion system loop may be calibrated, and system operability verified. Author

N76-22219# Aeronautical Research Inst. of Sweden, Stockholm.
STUDIES CONCERNING SNOW, ICE AND SLUSH ON RUNWAYS
Bo Norrbom et al 1975 105 p refs Transl. into ENGLISH of Swed. Rept. FFA-MU-792/862/934 Sponsored by Swed. Board for Tech. Develop.
(FFA-Memo-106; FFA-MU-792/862/934) Avail: NTIS HC $5.50

Braking action of a measuring trailer BV:11 (Skiddometer) was determined under certain meteorological conditions and for runways contaminated with ice, snow, slush or water. A comparison is made between experimental results and with landing aircraft. An analysis of airline pilots reported observations of braking conditions when landing and braking on contaminated runways is presented. Results show a relatively good correlation between braking action reported by pilots and that obtained with the BV:11. Friction measurements also show that it is possible to influence slippery runways favorably by keeping them free from contamination and by using a transverse slope greater than 1.5 percent in combination with an open, coarse macrostructure and a rough microstructure. For loose snow, slush or water the runway friction is dependent upon the speed. Friction measurements therefore ought to be carried out at more than one speed. Author (ESA)

N76-22220# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Angewandte Gasdynamik.
EVALUATION OF FORCE MEASUREMENTS OF FREE FLYING MODELS IN A GUN TUNNEL
Wolfgang Wyborny 22 Jan. 1976 45 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-10) Avail: NTIS HC $4.00; DFVLR, Cologne DM 18.50

A free flight testing system for reentry body models is shortly described, which allows 6-component measurements without the influence of a sting and without interferences between the aerodynamic forces and moments. The mathematical basis for

the evaluation of the tests is shown extensively. The usefulness of the tests is demonstrated for the AGARD-calibration model HB-2. Author (ESA)

N76-22221# Harry Diamond Labs., Adelphi, Md.
APPLICATIONS, TECHNIQUES AND PROCEDURES FOR DIGITAL COMPUTER CONTROL OF ARMY VIBRATION TESTING SINE SWEEP/DWELL TESTS
Abraham M. Frydman Sep. 1975 205 p refs
(HDL Proj. 789385)
(AD-A018349; HDL-TR-1665) Avail: NTIS CSCL 14/2

The Harry Diamond Laboratories has been concerned with the establishment of reliable and cost-effective vibration-test techniques that are applicable to Army production and qualification testing. To further this goal, use was made of a new test method in which a digital mini-computer with associated peripherals assumes direct and full control of sinusoidal vibration testing. Replacing conventional analog test techniques, the digital method upgrades test reliability and performance and reduces operating cost by reducing total test time. These potential benefits made it attractive for the Harry Diamond Laboratories to undertake an effort concerned with the technical applications, and procedures related to the new test control method. Also presented in this report are procedures for the implementation of direct-digital-computer control to Army sinusoidal vibration testing as well as the basic requirements for the applicable test equipment. GRA

N76-23096* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTIPURPOSE ELECTRIC FURNACE EXPERIMENT MA-010
A. Boese, J. McHugh (Westinghouse Res. Lab.), and R. Seidensticker (Westinghouse Res. Lab.) *In its* Apollo-Soyuz Test Project Feb. 1976 9 p (For availability see N76-23074 13-88)
CSCL 14B

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N76-22222*# Joint Publications Research Service, Arlington, Va.
ORBITS OF COOPERATION
V. S. Vereshchetin, V. V. Voronin, L. A. Vedeshin, V. A. Denisenko, V. A. Yegorov, V. I. Kozyrev, S. V. Pakhomov, S. V. Petrunin, M. A. Rimsha, V. P. Romantsov et al Washington NASA Dec. 1975 166 p refs Transl. into ENGLISH of the book "Orbity Sotrudnichestva" Moscow, Mashinostroyeniye Press, 1975 p 1-119
(NASA Order W-13183)
(NASA-TT-F-16590) Avail: NTIS HC $6.75 CSCL 22A

The Soviet Union's program of cooperation with other nations in the use of spaceships and satellites to explore and utilize outer space is discussed. Other fields covered are medical and biological research in space, space meteorology and communications, and the Soyuz-Apollo project. Author

N76-22223*# IIT Research Inst., Chicago, Ill.
SPACE PROCESSING OF CHALCOGENIDE GLASS Annual Summary Report, 22 Feb. 1975 - 21 Feb. 1976
M. A. Ali and D. C. Larsen 11 Mar. 1976 53 p refs
(Contract NAS8-30627; IITRI Proj. D6096)
(NASA-CR-144278; ASR-2) Avail: NTIS HC $4.50 CSCL 13H

The manner in which the weightless, containerless nature of in-space processing can be successfully utilized to improve the quality of infrared transmitting chalcogenide glasses was investigated. The following conclusions were reached: (1) Laboratory experiments have established the techniques, processes and equipment necessary for the production of high purity chalcogenide glasses. (2) Processing techniques have been successfully adopted for Ge28Sb12Se60 glass in a 1-g environment. (3) The Ge28Sb12Se60 glasses that have been processed have optical transmission around 63% (5 mm thick). (4) Laboratory experiments have established that the use of precursor materials in powdered form increases the oxygen contamination of the processed glass. This indicates that high purity precursor materials in bar or pellet form should be used. (5) Modifications were made on the MSFC acoustic levitator in an attempt to improve levitation stability during long-time experiments. Room temperature experiments on As2S3 glasses and high temperature experiments on polystyrene were conducted. Author

N76-22224*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB COROLLARY EXPERIMENTS
Jul. 1974 88 p refs
(NASA-TM-X-64809) Avail: NTIS HC $5.00 CSCL 22A

The evolution of the development and integration of Skylab experiments from initial concepts through mission operations is documented. All experiment systems are covered as well as management controls which were developed and exercised to assure acceptable operational capability and optimize data acquisition for final scientific results. Author

N76-22225*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SET COVERING ALGORITHM, A SUBPROGRAM OF THE SCHEDULING ALGORITHM FOR MISSION PLANNING AND LOGISTIC EVALUATION
Han Chang Mar. 1976 79 p refs
(Contract NAS9-12200)
(NASA-CR-147551; LEC-6842; JSC-09950) Avail: NTIS HC $5.00 CSCL 22A

A computer program using Lemke, Salkin and Spielberg's Set Covering Algorithm (SCA) to optimize a traffic model problem in the Scheduling Algorithm for Mission Planning and Logistics Evaluation (SAMPLE) was documented. SCA forms a submodule of SAMPLE and provides for input and output, subroutines, and an interactive feature for performing the optimization and arranging the results in a readily understandable form for output. Author

N76-23100* Grumman Aerospace Corp., Bethpage, N.Y.
ZERO-G PROCESSING OF MAGNETS EXPERIMENT MA-070
D. J. Larson, Jr. *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 13 p refs (For availability see N76-23074 13-88)
CSCL 20C

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N76-22226 Michigan Univ., Ann Arbor.
THEORY AND IMPROVED GRADIENT TYPE ALGORITHMS FOR OPTIMAL ATMOSPHERIC TRAJECTORIES Ph.D. Thesis
Ching-Jyh Shieh 1975 174 p
Avail: Univ. Microfilms Order No. 76-9514

Gradient type algorithms are improved and applied to optimal control problems with variable final time. Optimal trajectories of a thrusting lifting vehicle flying in a resisting medium are studied. For the case of thrusting flight, an optimal trajectory, in general, consists of various optimal subarcs, which are boosting, coasting and sustaining. The thrust level along a sustaining arc is obtained analytically. Propositions which help to predict the possible subarcs involved in an optimal trajectory are developed. For the case of pure coasting flight, a special technique proposed by Fave is applied to analyze reachable domain problems in a horizontal plane. A complete footprint is obtained without using an iterative process, and through the use of the dimensionless variables, the complete solution to a general reachable domain problem is given by specifying only two aerodynamic parameters of the vehicle considered. Dissert. Abstr.

N76-22227*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SCIENCE ASPECTS OF A 1980 FLYBY OF COMET ENCKE WITH A PIONEER SPACECRAFT Technical Report,

10 Sep. - 15 Dec. 1973
L. D. Jaffe, C. Elachi, C. E. Giffin, W. Huntress, R. L. Newburn, R. H. Parker, F. W. Taylor, and T. E. Thorpe 20 May 1974 166 p refs Sponsored by NASA
(NASA-CR-147091; JPL-760-96) Avail: NTIS HC $6.75 CSCL 22A

Results are presented of an investigation of the feasibility of a 1980 flyby of Comet Encke using a Pioneer class spacecraft. Specific areas studied include: science objectives and rationale; science observables; effects of encounter velocity; science encounter and targeting requirements; selection and description of science instruments; definition of a candidate science payload; engineering characteristics of suggested payload; value of a separable probe; science instruments for a separable probe; science payload integration problems; and science operations profile. Author

N76-22228# Academy of Sciences (USSR), Moscow. Space Research Inst.
THE TELEMETRY DATA USE FOR REFINING A PLANETARY ARTIFICIAL SATELLITE ORBIT
B. T. Bakhshiyan and A. A. Sukhanov 1975 12 p
(PR-248) Avail: NTIS HC $3.50

The errors of specifying coordinates and velocities of a planet essentially influence the accuracy of the Planetary Artificial Satellite (PAS) orbit determination based on the ground measurements of trajectory. The use of autonomous measurements simultaneously with the ground-based measurements is emphasized. The possibility of using telemetry data as autonomous measurements is considered that allows to define the moments of passing the planetary edge and terminator line by an axis of some instrument installed on-board the PAS. The method of this information processing is developed taking into account the main factors affecting the trajectory. The calculation results of the 'Mars-5' satellite are given. The performance of the telemetry data use for optimizing the trajectory parameters is shown. Author (ESA)

N76-22229# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE VALUE OF AN ORBITAL MINUTE
V. Smirnov 1 Dec. 1975 9 p Transl. into ENGLISH from Pravda (USSR), no. 203 (20807), 22 Jul. 1975 p 6
(AD-A018534; FTD-ID(RS)I-2398-75) Avail: NTIS CSCL 22/2

Time available to astronauts for scientific research and for performing tasks necessary for navigation and control of the space station is discussed. It is proposed to use onboard computers to automate the flight control systems of orbiting space stations. J.M.S.

N76-22230# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SALYUT TO BE SUPPLIED AUTOMATICALLY
26 Nov. 1975 9 p Transl. into ENGLISH from Avia Maandblad Voor Lucht-en Ruimtevaart (Netherlands), v. 33E, no. 12, Dec. 1974 p 372-373
(AD-A018540; FTD-ID(RS)I-2282-75) Avail: NTIS CSCL 22/2

In the near future, space stations of the Salyut type will be supplied automatically by unmanned Soyuz space ships to be guided from the earth and automatically coupled to the station. By this means cosmonauts staying on board a Salyut would not only be supplied with extra victuals, but also with fuel for the space station so that it can function for longer than is now the case. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *C9 Research Support Facilities (Air).*

N76-22231*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SMS INSTRUCTOR OPERATOR STATIONS. CE1 PART 1: DETAIL SPECIFICATION
1 Apr. 1976 34 p refs
(Contract NAS9-14910)
(NASA-CR-147651; JSC-10994-6-Pt-1) Avail: NTIS HC $4.00 CSCL 14B

The requirements for performance, design, test, and qualification of equipment identified as SMS Fixed and Moving Base Instructor-Operator-Observer Stations are identified. This specification is used to provide all hardware and wiring requirements necessary for these stations and to define their interface with other SMS specifications. Author

N76-22232*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SMS DATA BOOK
2 Apr. 1976 27 p
(Contract NAS9-14910)
(NASA-CR-147599; JSC-11012) Avail: NTIS HC $4.00 CSCL 14B

The design data bases for SMS crew stations, instructor/operator station, and station conversion and ancillary are presented. J.M.S.

N76-22233*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SMS ENGINEERING DESIGN REPORT
2 Apr. 1976 331 p
(Contract NAS9-14910)
(NASA-CR-147600) Avail: NTIS HC $10.00 CSCL 14B

The engineering design for the Shuttle Missions Simulator is presented in sections, with each section representing a subsystem development activity. Subsystems covered include: electrical power system; mechanical power system; main propellant and external tank; solid rocket booster; reaction control system; orbital maneuvering system; guidance, navigation, and control; data processing system; mission control center interface; and image display system. Author

N76-22234*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SMS DESIGN REVIEW PLAN, TYPE 1 DATA
2 Apr. 1976 10 p
(Contract NAS9-14910)
(NASA-CR-147596; JSC-10990) Avail: NTIS HC $3.50 CSCL 14B

The SMS PDR plan is submitted incrementally 15 days prior to the associated PDR's. The initial release contains a complete schedule for all PDR's plus the agendas for the first PDR's scheduled. Author

N76-22235*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SMS POWER AND GROUNDING. CEI PART 1: DETAIL SPECIFICATION, TYPE 1 DATA
26 Mar. 1976 20 p refs
(Contract NAS9-14910)
(NASA-CR-147597; JSC-10994-8-Pt-1) Avail: NTIS HC $3.50 CSCL 14B

This specification establishes the requirements for performance, design, test, and qualification of the SMS total power and grounding system. This is defined as designing a new PDU to be useable for SMS adding FBCS and modifying and adding to the OAS power systems, the emergency off system and the overheat warning system. The above design considers all S.O.W. requirements. Author

N76-22236*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SMS CREW STATION (C AND D PANELS AND FORWARD STRUCTURES). CEI PART 1: DETAIL SPECIFICATION, TYPE 1 DATA
31 Mar. 1976 118 p refs
(Contract NAS9-14910)
(NASA-CR-147598; JSC-10994-5-Pt-1) Avail: NTIS HC $5.50 CSCL 14B

Established are the requirements for performance, design, test and qualification of one type of equipment identified as SMS C&D panels and forward structures. This CEI is used to provide all hardware and wiring necessary for the C&D panels to be properly interfaced with the computer complex/signal conversion equipment (SCE), crew station, and software requirements as defined in other CEI specifications. Author

N76-22237*# Aeronutronic Ford Corp., Houston, Tex.
MISSION CONTROL CENTER (MCC) SYSTEM SPECIFICATION FOR THE SHUTTLE ORBITAL FLIGHT TEST (OFT) TIMEFRAME
[1976] 413 p refs Prepared in cooperation with IBM Corp., Houston
(Contracts NAS9-1261; NAS9-14350)
(NASA-CR-147575; JSC-10013) Avail: NTIS HC $11.00 CSCL 22D

System specifications to be used by the mission control center (MCC) for the shuttle orbital flight test (OFT) time frame were described. The three support systems discussed are the communication interface system (CIS), the data computation complex (DCC), and the display and control system (DCS), all of which may interfere with, and share processing facilities with other applications processing supporting current MCC programs. The MCC shall provide centralized control of the space shuttle OFT from launch through orbital flight, entry, and landing until the Orbiter comes to a stop on the runway. This control shall include the functions of vehicle management in the area of hardware configuration (verification), flight planning, communication and instrumentation configuration management, trajectory, software and consumables, payloads management, flight safety, and verification of test conditions/environment. Author

N76-22238# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Raumsimulation.
ESTIMATION OF THE FLOW CONDUCTANCE OF SHROUDS IN SPACE SIMULATION CHAMBERS
Hans Hamacher 12 Jan. 1976 42 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-05) Avail: NTIS HC $4.00; DFVLR, Cologne DM 19.40

Space simulation chambers often contain cryosurfaces (shrouds), which enclose the test specimen optically tight. The total conductance of the shrouds is determined by the conductance values of the shroud openings and of the space between shroud and chamber wall. Equations are developed which take both influences into consideration. For the case of the uncooled shroud the ratio between the net pumping speed available in the test space and the pumping speed in the level of the chamber entrance is determined. The deductions are based on a model which represents the space between shroud and chamber wall of a cylindrical chamber. The results are discussed with respect to the design parameters which come into consideration. The problem is demonstrated by applying the design values of the 2.5 m space simulation chamber of the DFVLR. Author (ESA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N76-22239*# Joint Publications Research Service, Arlington, Va.
IDEAS OF K. E. TSIOLKOVSKIY ON ORBITAL SPACE STATIONS
A. I. Kolchenko and I. V. Strazheva Washington NASA Apr. 1976 9 p refs Transl. into ENGLISH of Conf. paper from the Inst. of Hist. of Nat. Sci. and Technol., Acad. of Sci. of the USSR, Moscow Presented at 5th Symp. on Hist. of Astronaut at 12th Intern. Astronaut. Federation Congr., 20-25 Sep. 1971 10 p
(NASA Order W-13183)
(NASA-TT-F-16970) Avail: NTIS HC $3.50 CSCL 22B

Ideas on building orbital space stations and using them to form rings of settlements around planets, later to become autonomous planets circling the sun, are presented chronologically. Author

N76-22240*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
D-1A EQUIPMENT MODULE STRUCTURE TEST
T. F. Niezgoda Apr. 1976 53 p
(NASA-TM-X-73401; E-8724) Avail: NTIS HC $4.50 CSCL 22D

The Centaur Equipment Module (E/M) structural test program was performed in two parts due to an unscheduled hardware failure in the first test series. The objectives of the initial test program were to define the flexibility characteristics of the E/M, verify the design load capability, and determine its ultimate strength capability by loading to structural failure. However, during the first failure test attempt, the Intelsat IV MPA failed instead of the E/M. Therefore a new adapter was fabricated to simulate the HEAO mission adapter and the second series of tests were then performed. They concluded with the failure of the E/M forward interface ring resulting in about 3.5 degrees of permanent set on the high compression side. Nevertheless, the linear or useable strength capability of the E/M is greater or equal to that which is required for the HEAO missions. The E/M is deemed structurally qualified for the HEAO missions. Author

N76-22241# TRW Systems Group, Redondo Beach, Calif. Space Vehicles Div.
SPACE TEST PROGRAM STANDARD SATELLITE STUDY Final Report
John E. Taber 30 Oct. 1975 175 p
(Contract F04701-73-C-0249)
(AD-A018203; SAMSO-TR-75-277; Rept-23590-6008-TU-00) Avail: NTIS CSCL 22/2

This study concerned the conceptual design of a modular spacecraft for performing a large class of STP flights. Design approach and performance capabilities were balanced to yield a low-cost system for capturing many missions. The study included a review of weight, power, orientation, orbit, data, and contamination requirements and emphasized equipment groupings which minimize changes without constraining flexibility. The resulting design includes (a) a core module which contains basic power and communication and data handling functions and provides the shuttle interface with the shuttle, (b) several options for an orientation module containing attitude reference and control equipment, (c) a solid rocket or hydrazine propulsion module for accomplishing transfer from the shuttle orbit to the desired one, (d) a payload cluster for collecting payloads and interfacing them with the remaining modules, and (e) standard solar array panels and structures. GRA

N76-22242# Rockwell International Corp., Downey, Calif. Space Div.
SPACE TEST PROGRAM STANDARD SATELLITE LAUNCH OPTIMIZATION STUDY Final Report, 2 Jun. - 15 Sep. 1975
Myron A. Cantor 15 Sep. 1975 124 p refs
(Contract F04701-75-C-0127)
(AD-A018177; SD75-SA-0135; SAMSO-TR-75-276) Avail: NTIS CSCL 22/2

The primary objective of this study was to determine the shape and weight of an STP Standard Satellite which would have a maximum probability of being launched 'piggy-back' on an STS mission between 1980-1990. The study was conducted in two parts. Part 1 consisted of two tasks, Mission Analysis and System Analysis. In these tasks, a shuttle mission model was selected, preliminary STP-STD-satellite capabilities defined and each shuttle mission examined to determine the excess volume and weight available. GRA

N76-22243# Naval Postgraduate School, Monterey, Calif.
HARPOON MISSILE AIRBORNE COMMAND AND LAUNCH SYSTEM AVAILABILITY MODEL M.S. Thesis
Julian LaFayette Moon, III Sep. 1975 75 p refs
(AD-A018307) Avail: NTIS CSCL 16/4

Two models are developed for calculating the availability of the Harpoon missile airborne command and launch system

(HACLS). The first model is a semi-Markov process. Its assumptions are validated using the subsequently developed computer simulation model. Both models are exercised with parametric variations, the critical parameters being mean time to failure, mean time to repair, and severity of the operating environment. Less critical parameters are maintenance efficiency and, for the simulation only, maintenance time to repair probability distribution. A major discovery in this paper is that the standard definition of availability does not prove to be adequate when used to determine system availability in a complex framework of operations. Author (GRA)

N76-22244# Dikewood Corp., Los Angeles, Calif.
SGEMP FOR RESONANT STRUCTURES Final Report
K. S. H. Lee and L. Marin Nov. 1975 55 p refs
(Contract F29601-74-C-0010; AF Proj. 4695)
(AD-A018262; AFWL-TR-74-288) Avail: NTIS CSCL 17/2

Most satellites in existence to date are inherently resonant structures. By a resonant structure is meant that the currents and charges induced on it by an external transient electromagnetic source continue to oscillate without significant damping long after the external source has been turned off. In this note, the emphasis is on how important the resonance effects are on the system-generated electromagnetic pulse (EMP) and how to calculate them. The problem chosen for study is that of a thin cylindrical tube or a wire, which is a resonant structure, excited by a moving charged particle. The natural-mode method in conjunction with asymptotic expansion enables one to get an explicit analytical solution for the induced current on the wire. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N76-22245* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TELEMETRY SYNCHRONIZER Patent
Carroll T. Pardoe, inventor (to NASA) (APL) Issued 4 Apr. 1976 15 p Filed 4 Apr. 1975 Supersedes N75-22365 (13 - 14, p 1611) Sponsored by NASA
(NASA-Case-GSC-11868-1; US-Patent-3,953,674; US-Patent-Appl-SN-565290; US-Patent-Class-178-69.5; US-Patent-Class-328-155; US-Patent-Class-340-147SY; US-Patent-Class-340-207P) Avail: US Patent Office CSCL 17B

A telemetry data synchronizer is reported for achieving phase lock and synchronization of an input signal having a pseudorandom sequence. Official Gazette of the U.S. Patent Office

N76-22246*# Federation of Rocky Mountain States, Inc., Denver, Colo.
DATA COLLECTION OPERATIONAL SUPPORT SYSTEM, PART 1 Final Report
William R. Woughter, Jr. Nov. 1975 41 p
(Contract NAS5-20533)
(NASA-CR-144746) Avail: NTIS HC $4.00 CSCL 17B

The Data Collection Operational Support system has been shown to be a usable means of transmitting numerical data over a 2-way VHF satellite link. It is also capable of supporting educational applications. The design, operation, use, results, and recommendations of the system are discussed. Author

N76-22247*# Federation of Rocky Mountain States, Inc., Denver, Colo.
DATA COLLECTION OPERATIONAL SUPPORT SYSTEM, PART 2 Final Report
Apr. 1976 16 p ref
(Contract NAS5-20533)
(NASA-CR-144745) Avail: NTIS HC $3.50 CSCL 17B

Calibrated signal-strength data obtained at 10 sites in the Rockies and NASA telemetry data regarding the signal levels in the ATS 6 spacecraft are presented along with methodology to use the data to compute the carrier-to-noise rations and signal-to-noise rations at each of the calibrated sites. The data and methodology are also used to estimate the median values of these quantities for sites in the Rockies, Alaska, and Appalachia. Results are discussed. J.M.S.

N76-22248*# LinCom Corp., Pasadena, Calif.
HARDWARE SIMULATION OF Ku-BAND SPACECRAFT RECEIVER AND BIT SYNCHRONIZER, VOLUME 1
William C. Lindsey and Barry R. Eisenberg Mar. 1976 105 p refs
(Contract NAS9-14636)
(NASA-CR-147590; TR-03-7506-7-Vol-1) Avail: NTIS HC $5.50 CSCL 17B

A hardware simulation which emulates an automatically acquiring transmit receive spread spectrum communication and tracking system and developed for use in future NASA programs involving digital communications is considered. The system architecture and tradeoff analysis that led to the selection of the system to be simulated is presented. J.M.S.

N76-22249*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE-TO-SATELLITE SYSTEM AND ORBITAL ERROR ESTIMATES
P. E. Schmid, P. D. Argentiero, and F. O. Vonbun Jan. 1976 34 p refs Presented at the Precision Time and Time Interval Conf., Greenbelt, Md., 2-4 Dec. 1975
(NASA-TM-X-71093; X-932-76-5) Avail: NTIS HC $4.00 CSCL 22A

Satellite-to-satellite tracking and orbit computation accuracy is evaluated on the basis of data obtained from near earth spacecraft via the geostationary ATS-6. The near earth spacecraft involved are Apollo-Soyuz, GEOS-3, and NIMBUS-6. In addition ATS-6 is being tracked by a new scheme wherein a single ground transmitter interrogates several ground based transponders via ATS-6 to achieve the precision geostationary orbits essential in satellite-to-satellite orbit computation. Also one way Doppler data is being recorded aboard NIMBUS-6 to determine the position of meteorological platforms. Accuracy assessments associated with the foregoing mission related experiments are discussed. Author

N76-22250# Telecom Australia Research Labs., Melbourne.
TROPICAL RAIN ATTENUATION AT 11 GHz: ANALYSIS OF RESULTS TO APRIL 1975
G. F. Jenkinson Dec. 1974 22 p refs Report also issued as Rept-74/02
(Rept-6942; Rept-74/02) Avail: NTIS HC $3.50

A solar radiometer, operating near Innisfail, Queensland is used to study the attenuation at 11 GHz over earth-space paths. Results covering 18 months, including two wet seasons, are analyzed to provide attenuation statistics. Rain attenuation margins at 11 and 14 GHz are estimated for an Australian national satellite communication system. Rain intensity records are also examined to develop relationships to attenuation, and to assess space diversity performance. Author

N76-22251# Sandia Labs., Albuquerque, N.Mex.
MARS PENETRATOR TELEMETRY AND CONTROL SYSTEM

R. D. Bentley and A. B. Campbell [1975] 10 p Presented at the Intern. Telemetering Conf., Wash. D.C., 14 Oct. 1975 (SAND-75-5599; Conf-751008) Avail: NTIS HC $4.00

A new method for exploring the planet Mars has been proposed that will use ground penetrating vehicles to carry scientific instruments below the Martian surface. The subsurface performance of various sequences of complicated experiments poses challenges in the design of the telemetry and control links. This article describes the overall mission, the penetrator, the constraints imposed by the mission and the penetrator, and a design for the telemetry/control system. This design uses a microprogrammed microprocessor; the sequences of commands are stored in a Read-Only-Memory (ROM), and a particular sequence is initiated by transmitting from the earth the address in the ROM that contains the first of the commands for the specific sequence to be performed. Data from the experiments are stored in a memory for later transmission to an orbiter that serves as a relay station for the command and data links with earth. Author (ERA)

N76-22252# Washington Univ., Seattle. Office of Research in Medical Education.

ATS-6 SATELLITE EVALUATION Final Report

Charles W. Dohner, Thomas J. Cullen, and Elizabeth A. Zinser Sep. 1975 218 p refs

(Contract NO1-LM-4-4734)

(PB-247303/1; NLM/LHC-75/02) Avail: NTIS HC $7.75 CSCL 05I

The use of the National Aeronautics and Space Administration's ATS-6 Satellite in full duplex video and audio communication for medical education at sites remote from an established medical school is evaluated. A design that incorporates appropriate evaluation methods and mechanisms to gather pertinent information to assess the effectiveness of this system in medical education is described. The technical aspects were seen as quite adequate and did not appear to substantially inhibit interaction. User acceptance was determined to be high. Students mastered cognitive knowledge at least as well using this media as in regular instruction. GRA

N76-22253# Rome Air Development Center, Griffiss AFB, N.Y.

AN ANALYSIS OF THE SATELLITE/MISSILE TRAJECTORY AND GROUND SENSOR VISIBILITY COVERAGE USING THE MERCATOR PROJECTION

George A. Ellis and Patrick R. Hoffman Sep. 1975 54 p refs (AD-A018528; RADC-TR-75-238) Avail: NTIS CSCL 17/9

This report discusses the in-house computational analysis capability of the RADC/HP 9820A Calculator and some of its peripheral equipment. Descriptions are given of several programs that were developed to rapidly ascertain the merits of specific geodetic sensor locations exercised against specific classes of satellite/missile trajectories. With its constraint parameters, the specified sensor's volumetric visibility coverage is projected on the same Mercator Projection Map as the satellite/missile earth track. Thus, graphically, the user can determine the probability of satellite/missile observation. GRA

N76-22796 Ceskoslovenska Akademie Ved, Prague.

ON THE INTERPRETATION OF SCINTILLATIONS OF GEOSTATIONARY SATELLITE SIGNALS IN MIDDLE LATITUDES

Ludmila Triskova *In* Polish Acad. of Sci. Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 25-35 refs (For availability see N76-22792 13-46)

N76-22798 Technical Univ. of Wroclaw (Poland).

GROUND RECEIVING EQUIPMENT FOR METEOROLOGICAL SATELLITES OPERATING IN THE 137 MHz FREQUENCY BAND

Daniel J. Bem *In* Polish Acad. of Sci. Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 61-75 refs (For availability see N76-22792 13-46)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N76-22254+ Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.

ARIANE INTERSTAGE 1/2: EDGE PANEL COMPRESSION TESTS

F. W. Olivier 29 Aug. 1975 124 p refs

(FOK-RV-75-78) Avail: NTIS HC $5.50

Two compression tests were performed on panels which represent the upperbay to determine the stress distribution and failure load for the upperbay of the Ariane interstage 1/2. A description is given of the test results obtained analytically. The test shows a failure load, which is approximately 16 % higher than the ultimate load of the interstage 1/2 s.m. structure (after including factor for load increase due to disturbances). Author (ESA)

N76-22255*# Chrysler Corp., New Orleans, La. Space Div.

RESULTS OF AN INVESTIGATION OF JET PLUME EFFECTS ON A 0.010-SCALE MODEL (75-OTS) OF THE SPACE SHUTTLE INTEGRATED VEHICLE IN THE 8 X 7-FOOT LEG OF THE NASA/AMES UNITARY WIND TUNNEL (IA82C), VOLUME 1 Aerothermodynamic Data Report

P. J. Hawthorne (Rockwell Intern. Corp., Downey, Calif.) Mar. 1976 424 p 2 Vol.

(Contract NAS9-13247)

(NASA-CR-144597; DMS-DR-2219-Vol-1) Avail: NTIS HC $11.00 CSCL 22B

The primary test objective was to define the base pressure environment of the first and second stage mated vehicle in a supersonic flow field from Mach 2.60 through 3.50 with simulated rocket engine exhaust plumes. The secondary objective was to obtain the pressure environment of the Orbiter at various vent port locations at these same freestream conditions. Data were obtained at angles of attack from -4 deg through +4 deg at zero yaw, and at yaw angles from -4 deg through +4 deg at zero angle of attack, with rocket plume sizes varying from smaller than nominal to much greater than nominal. Failed Orbiter engine data were also obtained. Elevon hinge moments and wing panel load data were obtained during all runs. Photographs of test equipment and tested configurations are shown. Author

N76-22256*# Chrysler Corp., New Orleans, La. Space Div.

RESULTS OF AN INVESTIGATION OF JET PLUME EFFECT ON A 0.010-SCALE MODEL (75-OTS) OF THE SPACE SHUTTLE INTEGRATED VEHICLE IN THE 8 X 7-FOOT LEG OF THE NASA/AMES UNITARY WIND TUNNEL (IA82C), VOLUME 2 Aerothermodynamic Data Report

P. J. Hawthorne (Rockwell Intern. Corp., Downey, Calif.) Mar. 1976 786 p 2 Vol.

(Contract NAS9-13247)

(NASA-CR-144598; DMS-DR-2219-Vol-2) Avail: NTIS HC $18.75 CSCL 22B

For abstract, see N76-22255.

N76-22257*# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.

STANDARDIZATION AND PROGRAM EFFECT ANALYSIS (STUDY 2.4). VOLUME 2: EQUIPMENT COMMONALITY ANALYSIS Final Report

T. Shiokari 31 Jul. 1975 321 p refs 4 Vol.

(Contract NASw-2727)

(NASA-CR-147106; ATR-76(7364)-1-Vol-2) Avail: NTIS HC $9.75 CSCL 22B

The feasibility and cost savings of using flight-proven components in designing spacecraft were investigated. The components analyzed were (1) large space telescope, (2) stratospheric aerosol and gas equipment, (3) mapping mission, (4) solar maximum mission, and (5) Tiros-N. It is concluded

that flight-proven hardware can be used with not-too-extensive modification, and significant savings can be realized. The cost savings for each component are presented. F.O.S.

N76-22258*# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.
STANDARDIZATION AND PROGRAM EFFECT ANALYSIS (STUDY 2.4). VOLUME 3: DESIGN-TO-COST ANALYSIS Final Report
T. Shiokari 31 Jul. 1975 38 p refs 4 Vol.
(Contract NASw-2727)
(NASA-CR-147097; ATR-76(7364)-1-Vol-3) Avail: NTIS HC $4.00 CSCL 22B

The program procedures that were incorporated into an on-going 'design-to-cost' spacecraft program are examined. Program procedures are the activities that support the development and operations of the flight unit: contract management, documents, integration meetings, engineering, and testing. This report is limited to the program procedures that were implemented, with emphasis on areas that may depart from normal satellite development practices. Author

N76-22259*# TRW Systems, Redondo Beach, Calif.
PHASE B - FINAL DEFINITION AND PRELIMINARY DESIGN STUDY FOR THE INITIAL ATMOSPHERIC CLOUD PHYSICS LABORATORY (ACPL): A SPACELAB MISSION PAYLOAD. WORK BREAKDOWN STRUCTURE FOR PHASE C/D DR-MA-06 (PRELIMINARY ISSUE)
Apr. 1976 100 p
(Contract NAS8-31844)
(NASA-CR-144263) Avail: NTIS HC $5.00 CSCL 22B

The Work Breakdown Structure (WBS) and Dictionary (DR-MA-06) for initial and subsequent flights of the Atmospheric Cloud Physics Laboratory (ACPL) is presented. An attempt is made to identify specific equipment and components in each of the eleven subsystems; they are listed under the appropriate subdivisions of the WBS. The reader is cautioned that some of these components are likely to change substantially during the course of the study, and the list provided should only be considered representative. Author

N76-22260*# Delco Electronics, Santa Barbara, Calif.
ELECTROMECHANICAL FLIGHT CONTROL ACTUATOR
Feb. 1976 68 p
(Contract NAS9-14331)
(NASA-CR-147557; R76-29) Avail: NTIS HC $4.50 CSCL 22B

An electromechanical actuator that will follow a proportional control command with minimum wasted energy is developed. The feasibility of meeting space vehicle actuator requirements using advanced electromechanical concepts is demonstrated. Recommendations for further development are given. Author

N76-22261*# Rockwell International Corp., Downey, Calif. Space Div.
SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY. VOLUME 1: EXECUTIVE SUMMARY
Apr. 1976 57 p
(Contract NAS9-14000)
(NASA-CR-147665; SD76-SH-0092-Vol-1) Avail: NTIS HC $4.50 CSCL 22B

A preliminary design analysis of a stand alone payload integration device (IVE) is provided that is capable of verifying payload compatibility in form, fit and function with the shuttle orbiter prior to on-line payload/orbiter operations. The IVE is a high fidelity replica of the orbiter payload accommodations capable of supporting payload functional checkout and mission simulation. A top level payload integration analysis developed detailed functional flow block diagrams of the payload integration process for the broad spectrum of P/L's and identified degree of orbiter data required by the payload user and potential applications of the IVE. Author

N76-22262*# Rockwell International Corp., Downey, Calif. Space Div.
SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY. VOLUME 2: TECHNICAL DOCUMENT, PART 1
Apr. 1976 172 p
(Contract NAS9-14000)
(NASA-CR-147666; SD76-SH-0092-Vol-2-Pt-1) Avail: NTIS HC $6.75 CSCL 22B

The technical analysis is reported that was performed during the shuttle payload interface verification equipment study. It describes: (1) the background and intent of the study; (2) study approach and philosophy covering all facets of shuttle payload/cargo integration; (3)shuttle payload integration requirements; (4) preliminary design of the horizontal IVE; (5) vertical IVE concept; and (6) IVE program development plans, schedule and cost. Also included is a payload integration analysis task to identify potential uses in addition to payload interface verification.Author

N76-22263*# Rockwell International Corp., Downey, Calif. Space Div.
SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY. VOLUME 2: TECHNICAL DOCUMENT. PART 2: APPENDICES
Apr. 1976 171 p
(Contract NAS9-14000)
(NASA-CR-147667; SD76-SH-0092-Vol-2-Pt-2) Avail: NTIS HC $6.75 CSCL 22B

Appendices to the shuttle payload integration study provide for: (1) The interface verification equipment hardware utilization list; (2) the horizontal IVE in-field assembly procedure; and (3) payload integration baseline functional flow block diagrams and options. G.G.

N76-22264*# Rockwell International Corp., Downey, Calif. Space Div.
SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY. VOLUME 3: SPECIFICATION DATA
Apr. 1976 201 p
(Contract NAS9-14000)
(NASA-CR-147668; SD76-SH-0092-Vol-3) Avail: NTIS HC $7.75 CSCL 22B

A complete description is given of the IVE physical and performance design requirements as evolved in this study. The data are presented in a format to facilitate the development of an item specification. Data were used to support the development of the project plan data (schedules, cost, etc.) contained in Volume 4 of this report. Author

N76-22265*# Rockwell International Corp., Downey, Calif. Space Div.
SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY. VOLUME 4: PROJECT PLANS
Apr. 1976 71 p
(Contract NAS9-14000)
(NASA-CR-147669; SD76-SH-0092-Vol-4) Avail: NTIS HC $4.50 CSCL 22B

Interface verification equipment project plans, schedules and cost estimates are presented that include delivery to the customer and a preliminary operations support plan describing responsibilities and procedures for configuration control and logistics support during the operational phase. Documentation requirements for post delivery setup and initial operational certification, recertification, facilities support, scheduled maintenance, operational maintenance, handling, transportation, and operational procedures are identified. Author

N76-22266*# General Electric Co., Philadelphia, Pa.
ATMOSPHERIC CLOUD PHYSICS LABORATORY. REQUIREMENTS REVIEW PRESENTATION Final Definition and Preliminary Design Study
14 Apr. 1976 96 p
(Contract NAS8-31845)
(NASA-CR-144274) Avail: NTIS HC $5.00 CSCL 22B

An outline is presented of the study task flow and progress is identified in development of the atmospheric cloud physics laboratory. Author

N76-22267*# TRW, Inc., Redondo Beach, Calif.
ATMOSPHERIC CLOUD PHYSICS LABORATORY. REQUIREMENTS REVIEW Final Definition and Preliminary Design Study
15 Apr. 1976 151 p

(Contract NAS8-31844)
(NASA-CR-144275) Avail: NTIS HC $6.75 CSCL 22B

Progress in engineering of the atmospheric cloud physics laboratory is documented. Science requirements to be used for the remainder of the study are discussed. Author

N76-22268*# Sperry Flight Systems, Phoenix, Ariz.
SHUTTLE AUTOLAND SUPPORT PROGRAM Final Report, 1 Nov. 1975 - 31 Mar. 1976
Apr. 1976 216 p
(Contract NAS9-14569)
(NASA-CR-147589; Publ-71-0882-00-00) Avail: NTIS HC $7.75 CSCL 22B

The results of the space shuttle automatic landing support program studies performed from November 1, 1975 to March 31, 1976 were summarized. The following subjects were discussed: (1) software definition review (TAEM pre-final and Autoland only), (2) software definition review (KPIT scheduling), (3) deletion of air data, (4) June 1975 aero data update and check runs, (5) flat turn study, (6) guidance mode switching study, (7) flat turn study-additional data, (8) trajectory shaping study, (9) aero data tolerances, and (10) turbulence model study. Author

N76-22269*# Martin Marietta Corp., Denver, Colo.
ANALYSIS OF STRUCTURAL DYNAMIC DATA FROM SKYLAB. VOLUME 1: TECHNICAL DISCUSSION Final Report
Leonard Demchak and Harry Harcrow Mar. 1976 222 p refs 2 Vol.
(Contract NAS8-31224)
(NASA-CR-144285; MCR-76-179-Vol-1) Avail: NTIS HC $7.75 CSCL 22B

A compendium of Skylab structural dynamics analytical and test programs is presented. These programs are assessed to identify lessons learned from the structural dynamic prediction effort and to provide guidelines for future analysts and program managers of complex spacecraft systems. It is a synopsis of the structural dynamic effort performed under the Skylab Integration contract and specifically covers the development, utilization, and correlation of Skylab Dynamic Orbital Models. Author

N76-22270*# Martin Marietta Corp., Denver, Colo.
ANALYSIS OF STRUCTURAL DYNAMIC DATA FROM SKYLAB. VOLUME 2: SKYLAB ANALYTICAL AND TEST MODEL DATA Final Report
Leonard Demchak and Harry Harcrow Mar. 1976 216 p 2 Vol.
(Contract NAS8-31224)
(NASA-CR-144286; MCR-76-179-Vol-2) Avail: NTIS HC $7.75 CSCL 22B

The orbital configuration test modal data, analytical test correlation modal data, and analytical flight configuration modal data are presented. Tables showing the generalized mass contributions (GMCs) for each of the thirty tests modes are given along with the two dimensional mode shape plots and tables of GMCs for the test correlated analytical modes. The two dimensional mode shape plots for the analytical modes and uncoupled and coupled modes of the orbital flight configuration at three development phases of the model are included. Author

N76-22271*# PRC Systems Sciences Co., Los Angeles, Calif.
ANALYSIS OF SPACECRAFT ANOMALIES
Charles E. Bloomquist and Winifred C. Graham Mar. 1976 145 p refs
(Contract NAS2-9041)
(NASA-CR-137854; PRC-R-1833) Avail: NTIS HC $6.00 CSCL 22B

The anomalies from 316 spacecraft covering the entire U.S. space program were analyzed to determine if there were any experimental or technological programs which could be implemented to remove the anomalies from future space activity. Thirty specific categories of anomalies were found to cover nearly 85 percent of all observed anomalies. Thirteen experiments were defined to deal with 17 of these categories; nine additional experiments were identified to deal with other classes of observed and anticipated anomalies. Preliminary analyses indicate that all 22 experimental programs are both technically feasible and economically viable. Author

N76-22272*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A STATISTICAL APPROACH TO ESTABLISHING SUBSYSTEM ENVIRONMENTAL TEST SPECIFICATIONS
W. Brian Keegan Jun. 1974 27 p refs Presented at the 1974 Proc. of Inst. of Environ. Sci., 20th Ann. Meeting, Washington, D. C., Apr. 1974 Submitted for publication
(NASA-TM-X-71091; X-321-74-174) Avail: NTIS HC $4.00 CSCL 22B

Results are presented of a research task to evaluate structural responses at various subsystem mounting locations during spacecraft level test exposures to the environments of mechanical shock, acoustic noise, and random vibration. This statistical evaluation is presented in the form of recommended subsystem test specifications for these three environments as normalized to a reference set of spacecraft test levels and are thus suitable for extrapolation to a set of different spacecraft test levels. The recommendations are dependent upon a subsystem's mounting location in a spacecraft, and information is presented on how to determine this mounting zone for a given subsystem. Author

N76-22273*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF HEAT TRANSFER TESTS OF A 0.0175-SCALE SPACE SHUTTLE VEHICLE 5 MODEL (60-OTS) IN THE NASA-AMES RESEARCH CENTER 3.5-FOOT HYPERSONIC WIND TUNNEL (TEST IH48)
William H. Dye (Rockwell Intern. Corp., Downey, Calif.) and William K. Lockman (NASA. Ames Res. Center) Mar. 1976 970 p refs
(Contract NAS9-13247)
(NASA-CR-144599; DMS-DR-2248) Avail: NTIS HC $23.75 CSCL 22B

Heat transfer data are presented for a .0175-scale model of the Rockwell International Space Shuttle Vehicle 5. The primary purpose of these tests was to obtain aerodynamic interference heating data on the external tank in the tank alone, second-, and first-stage configurations. Data were also obtained on the Orbiter and solid rocket boosters. Nominal Mach Nos. of 5.2 and 5.3 at nominal freestream unit Reynolds numbers of 1.5 and 5.0 million per foot, respectively, were investigated. Photographs of the tested configurations and test equipment are shown. Author

N76-22274*# Chrysler Corp., New Orleans, La.
RESULTS OF TESTS IN THE AEDC VKF TUNNEL B USING THE PHASE CHANGE PAINT TECHNIQUE ON 0.04 SCALE 50 PERCENT FOREBODY MODELS (82-0) OF THE ROCKWELL SPACE SHUTTLE ORBITER (OH50A)
M. Quan (Rockwell Intern., Downey, Calif.) Feb. 1976 651 p refs
(Contract NAS9-13247)
(NASA-CR-144595; DMS-DR-2285) Avail: NTIS HC $16.25 CSCL 22B

Model information and data from wind tunnel tests conducted on 0.04 scale 50 percent forebody models of the Space Shuttle Orbiter were presented. These tests were conducted using the phase change paint technique to determine aerodynamic heating rates due to various proturberances and recessions. Angles of attack from 20 deg through 45 deg were investigated at Mach 8. Author

N76-22275*# McDonnell Aircraft Co., St. Louis, Mo.
SIMULATED LIGHTNING TEST SHUTTLE .03 SCALE MODEL Final Report
Don W. Clifford 11 Dec. 1974 68 p refs
(Contract NAS9-19370)
(NASA-CR-147671; MDC-A3155) Avail: NTIS HC $4.50 CSCL 22A

Lightning Attach Point tests were conducted for the space shuttle launch configuration (Orbiter, External Tank and Solid Rocket Boosters). A series of 250 long spark tests (15 to 20 foot sparks) determined that the orbiter may be struck on the nose, windshield brow, tail and wingtips during launch but not on the main engine nozzles which have been shown to be vulnerable to lightning damage. The orbiter main engine and SRB exhaust plumes were simulated electrically with physical models coated with graded resistance paints. The tests showed that the exhaust plumes from the SRB provide additional protection

for the main engine nozzles. However, the tests showed that the Orbiter Thermal Protection System (TPS), which has also been shown to be vulnerable to lightning damage, may be struck during launch. Therefore further work is indicated in the areas of swept stroke studies on the model and on TPS panels. Further attach point testing is also indicated on the free-flying orbiter. Photographs of the test setup are shown. Author

N76-22276*# McDonnell-Douglas Corp., St. Louis, Mo.
SHUTTLE ORBITER C-BAND BEACON ANTENNA LOCATION STUDY
J. F. Lindsey 30 May 1975 111 p refs
(Contract NAS9-13970)
(NASA-CR-147673; Rept-1.2-DN-B0203-003) Avail: NTIS HC $5.50 CSCL 22A

A recommendation for the location of the Space Shuttle C-Band Beacon Antenna(s) to be used during Approach and Landing Tests was made. The study has included an Orbiter-to-ground radar look angle evaluation, a vehicle shadowing evaluation and extensive 1/10-scale antenna pattern measurements. Locations were limited to the cutouts for the S-Band Quads and Hemis to minimize skin perturbation. The results show that a single C-Band Antenna located in the lower Hemi cutout will provide optimum coverage and eliminate the need for switching and the undesirable interferometer effects of two antennas. Author

N76-22277*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
SHUTTLE ORBITER S-BAND QUAD ANTENNA SWITCHING EVALUATION
J. F. Lindsey and David H. Orr Jan. 1975 70 p refs
(Contract NAS9-13970)
(NASA-CR-147672; Rept-1.2-DN-B0203-001) Avail: NTIS HC $4.50 CSCL 22A

Automatic switching of the shuttle orbiter S-band quad antennas by the orbiter on-board computers was evaluated. The development and use of an extensive computer program to determine antenna switch position states as a function of time for various orbital activities is described. The selection of the optimum quad antenna element at any given time is based on the look angle to the appropriate Tracking Data Relay Satellite (TDRS). It is shown that a 2.4 second period is required for updating the S-band quad antenna switch state based on a maximum roll rate of 2 deg per second. The possibility of a variable update period is suggested since the 2 deg per second attitude rate is seldom encountered and would, for example, dictate approximately 248,000 on-board computer calculations during Reference Mission 2. The average number of antenna switch state changes was found to be in the range of 1,300 for Reference Mission 2. Author

N76-22278*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
SPACE SHUTTLE OPERATIONS INTEGRATION PLAN
19 Sep. 1975 132 p refs
(Contract NAS9-13970)
(NASA-CR-147670) Avail: NTIS HC $6.00 CSCL 22A

The Operations Integration Plan is presented, which is to provide functional definition of the activities necessary to develop and integrate shuttle operating plans and facilities to support flight, flight control, and operations. It identifies the major tasks, the organizations responsible, their interrelationships, the sequence of activities and interfaces, and the resultant products related to operations integration. Author

N76-22279*# IBM Federal Systems Div., Houston, Texas.
SPACE SHUTTLE ORBITER AVIONICS SOFTWARE. RAMP FUNCTION GENERATOR I/O JITTER STUDY Final Report
18 Mar. 1975 7 p refs
(Contract NAS9-14444)
(NASA-CR-147559; Rept-76-SS-1004) Avail: NTIS HC $3.50 CSCL 22B

The ability of the Ramp Generator to output linear ramp function stimuli to the space shuttle aerosurfaces is determined. Recommendations are included. J.M.S.

N76-22280*# Beech Aircraft Corp., Boulder, Colo.
PRESSURE CONTROL AND ANALYSIS REPORT: HYDROGEN THERMAL TEST ARTICLE (HTTA)
20 Nov. 1971 42 p refs
(Contract NAS9-12105)
(NASA-CR-147544; ER-15465) Avail: NTIS HC $4.00 CSCL 22B

Tasks accomplished during the HTTA Program study period included: (1) performance of a literature review to provide system guidelines; (2) development of analytical procedures needed to predict system performance; (3) design and analysis of the HTTA pressurization system considering (a) future utilization of results in the design of a spacecraft maneuvering system propellant package, (b) ease of control and operation, (c) system safety, and (d) hardware cost; and (4) making conclusions and recommendations for systems design. Author

N76-22281# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
STUDY OF DOUBLE GIMBALLED MOMENTUM WHEELS IN THE ATTITUDE AND ORBIT CONTROL SYSTEM OF A GEOSTATIONARY COMMUNICATION SATELLITE
G. Boersma and F. J. Sonnenschein 24 Apr. 1975 59 p refs
(Contract NIVR-1765)
(NLR-TR-75056-U) Avail: NTIS HC $4.50

The potentials of a double gimballed momentum wheel as an actuator for attitude control are discussed with respect to the related subsystems. A comparison is made between possible attitude control systems (hybrid, active, semiactive systems) to obtain the conditions under which a double gimballed momentum wheel would be preferred. A justification of the double gimballed momentum wheel is given and the characteristics defining the wheel system, including factors such as angular momentum, rotor bearing, rotor speed, gimbal configuration and suspension, and actuators, are determined. They can serve as the input to a detailed design of an experimental model. . ESA

N76-22282# Marconi Space and Defence Systems Ltd., Camberley (England).
A STUDY OF ON BOARD BALANCING SYSTEMS FOR SPINNING SATELLITES
P. Stinchcombe, comp., D. Stewart, comp., and N. Houston, comp. Jan. 1976 543 p
(Contract ESTEC-2040/73-PP)
(T(F)S/096; ESA-CR(P)-790) Avail: NTIS HC $13.00

A comparative study is made of systems that can adjust in flight the spin axis alignment of a spinning satellite with an accuracy of the order of 0.01 deg. Topics covered are: (1) Determination of prelaunch and in-orbit causes of spin axis misalignment and their magnitude. (2) Trade-off of actuator principles: translation of a solid mass, spooling of tape and transfer of fluid. (3) Methods of measuring the spin-axis misalignment by optical or inertial sensors. (4) Definition and analysis of a balancing system for a rapidly spinning satellite. Accelerometers are used for alignment sensing. A fluid transport system is conceived that is based on the exchange of fluid between two reservoirs by translating one reservoir in a direction perpendicular to the spin axis. The system also provides passive nutation damping. Author (ESA)

N76-22283# Committee on Science and Technology (U. S. House).
SPACE SHUTTLE 1975: STATUS REPORT ON SCIENCE AND TECHNOLOGY, US HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS. FIRST SESSION SERIAL B
1975 96 p
(PB-248383/2) Avail: NTIS HC $2.25 CSCL 22B

Briefs submitted to a congressional committee relative to progress made in the design and development of a space shuttle system and supporting equipment are presented. GRA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N76-22284* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRANSLATORY SHOCK ABSORBER FOR ATTITUDE SENSORS Patent
George L. VonPragenau, Irvin T. Morgan, Jr., and Clifton A. Kirby, inventors (to NASA) Issued 27 Apr. 1976 5 p Filed 29 Oct. 1974 Supersedes N75-10407 (13 - 01, p 0054)
(NASA-Case-MFS-22905-1; US-Patent-3,952,980; US-Patent-Appl-SN-518545; US-Patent-Class-248-22; US-Patent-Class-188-1B; US-Patent-Class-248-358R) Avail: US Patent Office CSCL 14B

A translatory shock absorber is provided for mounting an attitude sensor thereon for isolating a sensor from translatory vibrations. The translatory shock absorber includes a hollow block structure formed as one piece to form a parallelogram. The absorber block structure includes a movable top plate for supporting the attitude sensor and a fixed base plate with opposed side plates interposed between. At the junctions of the side plates, and the base and top plates, there are provided grooves which act as flexible hinges for attenuating translatory vibrations. A damping material is supported on a pedestal which is carried on the base plate between the side plates thereof. The top of the damping material rests against the bottom surface of the top plate for eliminating the resonant peaks of vibration.
Official Gazette of the U.S. Patent Office

N76-22285*# Science Applications, Inc., Huntsville, Ala.
DATA ANALYSIS FOR SKYLAB PROTON SPECTROMETER
Charles W. Hill 13 Apr. 1976 96 p
(Contract NAS8-31372)
(NASA-CR-144261; SAI-77-518-HU) Avail: NTIS HC $5.00 CSCL 14B

The data from a proton spectrometer flown aboard Skylab is examined. The instrument is sensitive to protons in the energy range 18 to 400 MeV. A partial failure of the spectrometer restricted spectral analysis to two energy bands, 18 to 27 MeV and 27 to 400 MeV. The directional data showed that a Gaussian angular distribution parameter of at least 70 degrees is required for the low energy band and at least 40 degrees for the high energy band. The data, integrated over angle, indicate that the AP3 model extrapolated down to 18-27 MeV is high by factors of 2 to 5 over most of the B-L space mapped. In the 27 to 400 MeV range, the AP3 model is 20 to 100 percent low at low and high values of L, and is high at medium L values in the B-L space mapped. Author

N76-22286*# Teledyne Titanium, Monroe, N.C.
COMMAND DECODER SYSTEM Final Report
31 Mar. 1976 7 p
(Contract NAS9-13813)
(NASA-CR-147568; WA-2164) Avail: NTIS HC $3.50 CSCL 14B

The production and testing of hardware design for use in evaluating shuttle instrumentation, data processing, and ground checkout operations are described. Changes incorporated to make improvements as a result of system testing are included. Author

N76-22287*# Gustincic (J. J.) Consulting Engineer, Marina Del Rey, Calif.
DESIGN OF AN OFFSET FED SCANNING ANTENNA FOR THE SHUTTLE IMAGING MICROWAVE SYSTEM Interim Report
J. J. Gustincic 14 Apr. 1975 64 p ref Prepared for JPL
(Contracts NAS7-100; JPL-954145)
(NASA-CR-147166; TR070) Avail: NTIS HC $4.50 CSCL 09C

A design study is described for a mechanically scanned offset fed parabolic torus reflector antenna having a 4m x 2m aperture for simultaneous use at eleven frequency channels from UHF to millimeter wavelengths. A design for the antenna is presented utilizing dipole and horn feeds at the low frequencies and a Gregorian aberration correcting subreflector system for feeding the torus at the high frequencies. The results and details of a theroetical study based on geometrical optics performed to evaluate the high frequency design and the results of an experimental study involving a one-tenth scale model for evaluation of the low-frequency behavior are given. Beam efficiencies, antenna patterns, beamwidths and cross polarization levels are presented and these results demonstrate that the antenna concept is viable for the Shuttle Imaging Microwave System requirement. Author

N76-22288*# Ultrasystems, Inc., Irvine, Calif.
ANALYSIS OF THE SURVIVABILITY OF THE SHUTTLE (ALT) FAULT-TOLERANT AVIONICS SYSTEM Final Report
Apr. 1976 165 p refs
(Contract NAS9-14739)
(NASA-CR-147660; Rept-76/6.43-9) Avail: NTIS HC $6.75 CSCL 22B

An extension of the Complementary-Analytic-Simulative Technique (CAST) is presented which is applicable to the Shuttle Data Processing Subsystem (DPS). A two step process was used. The first step provides models, both analytic and simulative, for analysis of the Approach-Landing Test (ALT) configuration. The ALT modeling and analysis are presented. Since CAST had already been shown to be multicomputer systems, the emphasis was placed on extending the CAST concept so it is applicable to computer systems including the multiplicity of input and output devices found in a real-time control system application. The DPS mission-critical survivability for a six-hour mission was determined to be 0.999863 for the Shuttle ALT baseline configuration. Thus it can be said that for ALT, the survivability is adequate. However, the fact that orbiting missions of up to 30 days are planned illustrates the necessity of extending the ALT work to be applicable to OFT and actual mission scenarios. The above analysis led to the evaluation of three selected options which identified two areas of possible improvement. These improvements would result from use of a recovery technique which combines roll ahead with memory copy, and increased TACAN fault detectability.
Author

N76-22289*# Ultrasystems, Inc., Irvine, Calif.
ANALYSIS OF THE SURVIVABILITY OF THE SHUTTLE (ALT FAULT-TOLERANT AVIONICS SYSTEM, APPENDICES Final Report
Apr. 1976 264 p
(Contract NAS9-14739)
(NASA-CR-147661; Rept-76/6.43-9) Avail: NTIS HC $9.00 CSCL 22B

The analytic model program which calculated the baseline parameter data is described along with the input deck setup which includes four groups of input parameters. F.O.S.

N76-22290*# TRW Systems Group, Redondo Beach, Calif.
AMPS PARTICLE ACCELERATOR DEFINITION STUDY Final Report
J. M. Sellen, Jr. 30 Jun. 1975 168 p refs
(Contract NAS8-31375)
(NASA-CR-144259; TRW-8-31375-AMPS-FR) Avail: NTIS HC $6.75 CSCL 14B

The Particle Accelerator System of the AMPS (Atmospheric, Magnetospheric, and Plasmas in Space) payload is a series of charged particle accelerators to be flown with the Space Transportation System Shuttle on Spacelab missions. In the configuration presented, the total particle accelerator system consists of an energetic electron beam, an energetic ion accelerator, and both low voltage and high voltage plasma acceleration devices. The Orbiter is illustrated with such a particle accelerator system. Author

N76-22291# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON PASSIVE NUTATION DAMPERS. VOLUME 1: LITERATURE SURVEY AND ANALYSIS
L. J. Ancher, H. vdBrink, and A. Pouw Dec. 1975 218 p refs 3 Vol.
(Contract ESTEC-2318/74-AK)
(FOK-RV-75-110-Vol-1; ESA-CR(P)-788-Vol-1) Avail: NTIS HC $7.75

Passive type nutation dampers were analyzed for single spin satellites. A literature survey was carried out, and a list of criteria was compiled and used for a comparison of damper types. The following damper types were selected for further study since they are the most promising in terms of mass, performance, and reliability for future missions: pendulum with eddy current damping, tube with endpots damper, and partly filled annular damper. A mass-spring-dashpot damper was also studied. For each type, the damper-only equation was derived after decoupling the satellite motion and the damper motion. The coupled equations of motion were derived. The Routh-Hurwitz stability criterion was analyzed for the mass-spring-dashpot damper using linearized equations of motion. Existing methods of simulating the flight performance of the damper on the ground are outlined. For volumes 2 and 3, see ESR-96981 and ESR-96982. ESA

N76-22292# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON PASSIVE NUTATION DAMPERS. VOLUME 2: DAMPER SELECTION AND DIMENSIONING
L. J. Ancher, H. vdBrink, and A. Pouw Dec. 1975 213 p refs 3 Vol.
(Contract ESTEC-2318/74-AK)
(FOK-RV-75-110-Vol-2; ESA-CR(P)-788-Vol-2) Avail: NTIS HC $7.75

Passive type nutation dampers were analyzed for single spin satellites. Types studied are: pendulum with eddy current damping, tube with endpots damper, and partly filled annular damper. A mass-spring-dashpot damper was also considered. A selection and dimensioning procedure of damper type is presented. The type of damper which should preferably be used in a given mission depends on both mission requirements and satellite parameters. A rigorous and a simplified dimensioning procedure is given for the pendulum and tube with endpots damper. The selection and dimensioning procedure is exemplified for three satellite missions defined by ESTEC. For volumes 1 and 3, see ESR-96980 and ESR-96982. ESA

N76-22293# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON PASSIVE NUTATION DAMPERS. VOLUME 3: APPENDICES
L. J. Ancher, H. vdBrink, and A. Pouw Dec. 1975 128 p 3 Vol.
(Contract ESTEC-2318/74-AK)
(FOK-RV-75-110-Vol-3-APP; ESA-CR(P)-788-Vol-3-App) Avail: NTIS HC $6.00

Passive type nutation dampers were analyzed for single spin satellites. Types studied are: pendulum with eddy current damping, tube with endpots damper, and partly filled annular damper. A mass-spring-dashpot damper was also considered. A literature matrix covering details of 108 publications studied is presented. Also included are mathematical details concerning mainly equations of motion of the various damper types. For volumes 1 and 2; see ESR-96980 and ESR-96981. ESA

N76-22294# Chrysler Corp., New Orleans, La.
OPTICAL ANGULAR MOTION SENSOR, PHASE 1 Final Report, 1 Oct. 1973 - 30 Apr. 1975
H. T. Braswell, J. W. Fontenot, L. L. Hartley, B. F. Heinrich, W. E. Miller, N. J. Ockman, S. W. Paulson, and J. R. Taylor 1 Apr. 1975 286 p refs
(Contract F04701-74-C-0062)
(AD-A011576; SAMSO-TR-75-120) Avail: NTIS CSCL 22/2

The optical angular motion sensor (OAMS) program, phase I, consisted of the design, fabrication, test and analysis of a triaxial angular motion sensor. A brassboard system was fabricated and assembled. It included a transmitter, a receiver assembly and an electronics assembly. The alignment information was transmitted between the transmitter and receiver on three discrete polarized light beams. The detail design and supporting analysis for the brassboard demonstration model includes electronics and optical components, thermal analysis, compensation circuitry and environmental stability to demonstrate the performance requirements. The selection of parts, materials and processes for the design and fabrication were in accordance with the required specifications. GRA

N76-22295# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ULTRAVIOLET RADIOMETER INTEGRATION AND LAUNCH ACTIVITIES Final Report, Aug. 1974 - Aug. 1975
W. M. Johnson and R. L. Wheeler Jul. 1975 91 p refs
(Contract F04701-74-C-0466)
(AD-A018287; R-891; SAMSO-TR-75-223) Avail: NTIS CSCL 22/3

This report of the integration and launch activities covers the period immediately preceeding the launch of the ultraviolet radiometer payload in the Air Force program, P72-2. Emphasis is placed on the final integration activities, orbital operation activities and software support provided by the ultraviolet radiometer payload contractor. Author (GRA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N76-22296* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVICE FOR INSTALLING ROCKET ENGINES Patent
Thomas R. George, Jr., inventor (to NASA) (Rocketdyne, Canoga Park, Calif.) Issued 27 Apr. 1976 6 p Filed 25 Apr. 1975 Supersedes N75-22356 (13 - 14, p 1609) Sponsored by NASA
(NASA-Case-MFS-19220-1; US-Patent-3,952,998; US-Patent-Appl-SN-571821; US-Patent-Class-254-124; US-Patent-Class-89-1.801; US-Patent-Class-254-93R) Avail: US Patent Office CSCL 21H

A device for installing rocket engines is reported that is supported at a cant relative to vertical by an axially extensible, tiltable pedestal. A lifting platform supports the rocket engine at its thrust chamber exit, including a mount having a concentric base characterized by a concave bearing surface, a plurality of uniformly spaced legs extended radially from the base, and an annular receiver coaxially aligned with the base and affixed to the distal ends of said legs for receiving the thrust chamber exit. The lifting platform rests on a seat concentrically related to the pedestal and affixed to an extended end portion thereof having a convex bearing surface mated in sliding engagement with the concave bearing surface of the annular base for accommodating a rocking motion of the platform.
Official Gazette of the U.S. Patent Office

N76-22297*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SYSTEM TESTS WITH ELECTRIC THRUSTER BEAM AND ACCELERATOR DIRECTLY POWERED FROM LABORATORY SOLAR ARRAYS
John B. Stover Washington Apr. 1976 28 p refs
(NASA-TM-X-3353; E-8546) Avail: NTIS HC $4.00 CSCL 21C

Laboratory high voltage solar arrays were operated directly connected to power the beam and accelerator loads of an 8-centimeter ion thruster. The beam array comprised conventional 2 by 2 centimeter solar cells; the accelerator array comprised multiple junction edge-illuminated solar cells. Conventional laboratory power supplies powered the thruster's other loads. Tests were made to evaluate thruster performance and to investigate possible electrical interactions between the solar arrays and the thruster. Thruster performance was the same as with conventional laboratory beam and accelerator power supplies. Most of the thruster beam short circuits that occurred during solar array operation were cleared spontaneously without automatic or manual intervention. No spontaneous clearing occurred during conventional power supply operation. Author

N76-22298*# Joint Publications Research Service, Arlington, Va.
ON FUNDAMENTALLY NEW SOURCES OF ENERGY FOR

ROCKETS IN THE EARLY WORKS OF PIONEERS IN ASTRONAUTICS
T. M. Melkumov Washington NASA Apr. 1976 12 p refs Transl. into ENGLISH from Russian paper presented at third-fifth History of Astronautics Symposia of the Intern. Acad. of Astronautics, 1969-1971 15 p
(NASA Order W-13183)
(NASA-TT-F-16971) Avail: NTIS HC $3.50 CSCL 21I

Rocket fuel ideas of space flight pioneers are traced historically. Contrasting views as to feasibility of electrothermal, electrohydrogen and nuclear energy rocket engines are outlined. Ejection of positively charged and negatively charged particles in two streams from the rocket exhaust nozzle is discussed. Calculations made in early articles are detailed. Solar energy trapping mirrors fixed on earth are examined as power sources for rocket engines. Author

N76-22299*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
DOUBLE ION PRODUCTION IN MERCURY THRUSTERS M.S. Thesis
Ralph R. Peters Apr. 1976 86 p refs
(Grant NGR-06-002-112)
(NASA-CR-135019) Avail: NTIS HC $5.00 CSCL 21C

The development of a model which predicts doubly charged ion density is discussed. The accuracy of the model is shown to be good for two different thruster sizes and a total of 11 different cases. The model indicates that in most cases more than 80% of the doubly charged ions are produced from singly charged ions. This result can be used to develop a much simpler model which, along with correlations of the average plasma properties, can be used to determine the doubly charged ion density in ion thrusters with acceptable accuracy. Two different techniques which can be used to reduce the doubly charged ion density while maintaining good thruster operation, are identified as a result of an examination of the simple model. First, the electron density can be reduced and the thruster size then increased to maintain the same propellant utilization. Second, at a fixed thruster size, the plasma density, temperature and energy can be reduced and then to maintain a constant propellant utilization the open area of the grids to neutral propellant loss can be reduced through the use of a small hole accelerator grid. Author

N76-22300*# National Aeronautics and Space Administration, Washington, D.C.
PRESSURIZATION SYSTEMS FOR LIQUID ROCKETS NASA Space Vehicle Design Criteria (Guidance and Control)
Oct. 1975 167 p refs
(NASA-SP-8112) Avail: NTIS HC $6.75 CSCL 21H

Guidelines for the successful design of pressurization systems for main propulsion, auxiliary propulsion, and attitude control systems for boosters, upper stages, and spacecraft were presented, drawing on the wealth of design experience that has accumulated in the development of pressurization systems for liquid rockets operational in the last 15 years. The design begins with a preliminary phase in which the system requirements are received and evaluated. Next comes a detail-design and integration phase in which the controls and the hardware components that make up the system are determined. The final phase, design evaluation, provides analysis of problems that may arise at any point in the design when components are combined and considered for operation as a system. Throughout the monograph, the design tasks are considered in the order and manner in which the designer must handle them. Author

N76-22301# Technologieforschung G.m.b.H., Stuttgart (West Germany).
EXPERIMENTAL PROGRAM FOR INVESTIGATION OF A PROPULSION SYSTEM WITH PRESSURE FEED AND MULTIPLE CLUSTERING (PHASE 1) Final Report [EXPERIMENTALPROGRAMM ZUR UNTERSUCHUNG EINES ANTRIEBSYSTEMS MIT DRUCKFOERDERUNG UND VIELFACHBUENDELUNG (PHASE 1)]
Dec. 1973 388 p refs Partly in GERMAN and partly in ENGLISH
(Contract RV-I-2-MK-V15/72)
(TF-021-EB-73) Avail: NTIS HC $10.75

Results of studies and tests related to the development of low cost rocket propulsion are reported. The low cost booster concept is based on clustering identical modules to obtain desired orbiting capacity. Each module consists of a fuel tank, oxidizer tank, manifold, shear web structure, 36 engines and associated instrumentation, electrical power systems, and guidance package. The following topics are discussed: fuel feed, thermal analysis of hot gas tubes, propulsion system simulation, control system analysis, propulsion system dynamics, 6-D flight path analysis, mass and cost analysis, electric valve actuators, manufacture of propulsion system, and single engine tests. ESA

N76-22302# Technologieforschung G.m.b.H., Stuttgart (West Germany).
EXPERIMENTAL PROGRAM FOR INVESTIGATION OF A PROPULSION SYSTEM WITH PRESSURE FEED AND MULTIPLE CLUSTERING (PHASE 2) Final Report
Jul. 1974 272 p In GERMAN; ENGLISH summary
(Contract RV-I-2-MK-V9/73)
(TF-021-EB-74) Avail: NTIS HC $9.00

The design verification of low cost rocket propulsion using pressure fed multi-engine clustering is described. Investigations were concentrated on narrow clustering of liquid propellant rocket engines. Six 30 kN motors are fed from a common propellant source, and it is demonstrated that a wide range of inlet pressure (20 to 30 bar) and throttleability to 50% of nominal thrust for vehicle attitude control is feasible. Additional studies on cost analysis and flight control analysis, specific to the cost optimized launch vehicle, were performed. This design verification program demonstrated the feasibility of a 80% cost reduction in expendable rockets, missiles, and launch vehicles. ESA

N76-22303# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
FACTORS INFLUENCING THE CHOICE OF AN ORBITAL PROPULSION SYSTEM FOR GEOSTATIONARY SATELLITES
G. Boersma and F. J. Sonnenschein 24 Apr. 1975 31 p refs
(Contract NIVR-1765)
(NLR-TR-75055-U) Avail: NTIS HC $4.00

The requirements of orbit control of geostationary communications satellites were investigated, and electrical propulsion for mission lives up to 15 years was compared. The mass of electrical propulsion is lower than that of chemical systems, even when mass penalties for the low reliability of the ion thrusters and the generation of electrical energy are taken into account. The free inclination drift orbit is an alternative to the high demands of north-south stationkeeping, but different pointing control and antenna steering is necessary. The influence of the orbit control system on the attitude control is discussed. The study was performed in connection with a definition study of a double gimballed momentum wheel, where realistic disturbance torques due to the orbit control system had to be estimated.
Author (ESA)

N76-22304# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
ELECTROMAGNETIC COMPATIBILITY OF AC POWER DISTRIBUTION Final Report
H. Hufnagel, F. Reisinger, M. Wagner, and G. Mounts Jun. 1975 81 p refs
(Contract ESTEC-1781/72-AA)
(ESA-CR(P)-792) Avail: NTIS HC $5.00

The susceptibility of normal spacecraft users and subsystems to electromagnetic fields observed in conjunction with ac power distribution was investigated. Essential ac-source parameters were frequency, voltage, current and waveshape. The susceptibility of components was determined on the basis of unit design experience and compared with tolerable suppression efforts on the distribution level. Practical measurements were then used to establish the degree of ac interference. The results were applied to the Helios engineering model. It is demonstrated that the application of square-wave ac power to conventional scientific or applications satellites should pose no problems essentially different from those encountered with an equivalent dc power system. Author (ESA)

N76-22305# Aerojet Solid Propulsion Co., Sacramento, Calif.
FLEXIBLE CASE-GRAIN INTERACTION IN BALLISTIC

WEAPON SYSTEMS: STRUCTURAL TEST VEHICLE EVALUATION Special Technical Report, 1 May 1972 - 31 Dec. 1973
Samuel W. Jang, Kenneth W. Bills, Jr., and Harold Leeming (Leeming (Harold) and Associates, Redlands, Calif.) Oct. 1975 225 p refs
(Contract F04611-72-C-0055; AF Proj. 3059)
(AD-A017557; ASPC-1953-26SR-3; AFRPL-TR-75-7) Avail: NTIS CSCL 21/8

Five series of Structural Test Vehicle studies were conducted to verify that several types of embedded stress transducers and their installation methods could be successfully used with the fiberglass chamber of the Minuteman 3, Third Stage motor. The results showed that the transducers could be installed with leadwires brought out through the case wall without causing fluid leakage paths or degrading the case structure. Potting of normal stress transducers in an inert trowellable insulation was shown to yield the same stress measurements as potting them in propellant. 'Ruggedized' shear transducers were shown to function successfully up to the point of propellant/liner interface failure in shear. Successful performance of elastomeric failure event gages in the detection of bondline shear failure was demonstrated. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N76-22306# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF OBTAINING DERIVATIVES OF 3,5-DINITRO-1, 2,4-TRIAZOLE
T. P. Kofman, M. S. Pevzner, and V. I. Manuylova 28 Nov. 1975 9 p Transl. into ENGLISH from Russian Patent No. 432147 (15 Jun. 1974) p 1-2
(AD-A018533; FTD-ID(RS)I-2395-75) Avail: NTIS CSCL 07/3

A method is proposed for obtaining derivatives of 3,5-dinitro 1,2,4-triazole. Analytical data is given in tabular form. J.M.S.

N76-22307# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
AN ERROR ANALYSIS OF FAILURE PREDICTION TECHNIQUES DERIVED FROM FRACTURE MECHANICS Interim Report, 1 Jul. - 30 Dec. 1975
S. M. Wiederhorn, F. R. Fuller, Jr., J. Mandel, and A. G. Evans (Rockwell Intern. Corp., Thousand Oaks, Calif.) Dec. 1975 41 p refs Sponsored in part by the AF
(PB-248910/2; NBSIR-75-952) Avail: NTIS HC $4.00 CSCL 11B

Three principal methods of failure prediction for brittle materials are analyzed statistically. Each method depends on fracture mechanics for its predictive value and hence, the variance of the failure time is found to depend on the scatter in the fracture mechanics data and the scatter in the estimate of the initial size of the strength limiting crack. The variance is used to calculate confidence limits for the prediction of failure for two materials, glass and silicon carbide. Procedures for the collection and analysis of data are discussed, and the implications of the analysis for lifetime prediction are evaluated. GRA

N76-22308# Edgewood Arsenal, Aberdeen Proving Ground, Md. Chemical Lab.
DIRECT DETERMINATION OF THE OPTICAL PURITIES OF PHOSPHORUS COMPOUNDS USING NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY Technical Report, Jul. 1974 - May 1975
Linda L. Szafraniec Nov. 1975 25 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A018564; EC-TR-76010) Avail: NTIS CSCL 07/3

Tris (3-trifluoroacetyl-d-camphorato) europium (III), Eu (facam)3, is a useful NMR shift reagent for the direct determination of the optical purities of many phosphorus compounds of interest to these laboratories. In the presence of the optically active lanthanide chelate, the optical isomers (enantiomers) have nonequivalent NMR spectra. Generally, the shift differences are large enough for complete separation of at least one set of enantiotopic signals, and enantiomeric compositions (optical purities) can be determined directly from relative peak areas. While Fu (facam) 3 interacts successfully with most phosphoryl compounds of interest, it does not interact well with thiophosphoryl or trivalent phosphorus compounds. Thus, it cannot be used to determine the enantiomeric compositions of these classes of compounds. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N76-22309* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BEARING MATERIAL Patent
Harold E. Sliney, inventor (to NASA) Issued 27 Apr. 1976 7 p Filed 10 Oct. 1974 Supersedes N75-15746 (13 - 07, p 0747)
(NASA-Case-LEW-11930-1; US-Patent-3,953,343; US-Patent-Appl-SN-513611; US-Patent-Class-252-12) Avail: US Patent Office CSCL 11D

A composite material is described which will provide low friction surfaces for materials in rolling or sliding contact and is self-lubricating and oxidation resistant up to and in excess of about 930 C. The composite is comprised of a metal component which lends strength and elasticity to the structure, a fluoride salt component which provides lubrication and, lastly, a glass component which not only provides oxidation protection to the metal but may also enhance the lubrication qualities of the composite. Official Gazette of the U.S. Patent Office

N76-22310*# Kanner (Leo) Associates, Redwood City, Calif.
CHANGES IN ELECTRICAL CROSS-RESISTANCE OF CONDUCTIVE COATINGS DUE TO CONTAMINATION BY OUTGASSING OF SILICON RUBBER MATERIAL SILASTIC 35
Hans Bentlage, Hans-Peter Spanier, and Walter Wilkens Washington NASA Apr. 1976 16 p Transl. into ENGLISH of "Aenderungen des Elektrischen Querwiderstandes von Conductive Coatings infolge Kontamination durch Ausgasendes Silikonkautschukmaterial Silastic 35", Rept. IB 152-75/04 Abt. Werkstoffe unter Weltraumbedingungen, Inst. fuer Flugzeugbau, West Germany, 1975 28 p
(Contract NASw-2481)
(NASA-TT-F-16727) Avail: NTIS HC $3.50 CSCL 11D

The increase of electrical cross resistance of conductive coatings due to the build up of contamination layers has been investigated in situ with respect to conductive coatings proposed for the HELIOS spacecraft. A new test set-up was designed and used for measuring simultaneously the contamination by a microgravimetric and the cross resistance by a contactless electrical method. The results show a strong increase of the cross resistance by the contaminating volatile condensables of an outgassing silicone elastomer. At the HELIOS operational conditions, however, the cross resistance will not exceed the specified upper limit of 20 MOhms/sq cm. Author

N76-22311# Royal Aircraft Establishment, Farnborough (England).
FRACTURE SURFACE OBSERVATIONS OF FATIGUE CRACK GROWTH IN AlZnMgCu 0.5 F 46
K.-H. Schwalbe Feb. 1976 25 p refs Transl. into ENGLISH from Z. Metallk. (West Germany), v. 66, no. 7, 1975 p 408-416
(RAE-Lib-Trans-1878; BR51497) Avail: NTIS HC $3.50

From fractographic observations, it can be concluded that the growth of fatigue cracks in the aluminum alloy AlZnMgCu 0.5 F 46 at medium growth rates is characterized by the formation of striations on the fracture surface. At high growth rates, there is a gradual transition from the striation mechanism to one involving the formation of dimples at inclusions. The stress intensity range at this transition can be estimated by means of a simple model. It is shown that the crystallographic crack growth

models presented in the literature can be modified to explain curved striations. Author

N76-22312*# Georgia Inst. of Tech., Atlanta. School of Ceramic Engineering.
INVESTIGATION OF THE SPACE PROCESSING OF UNIDIRECTIONALLY SOLIDIFIED OXIDE-METAL COMPOSITES Final Technical Report, 5 March - 1 Dec. 1974
A. T. Chapman and J. K. Cochran 20 Nov. 1974 77 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953844)
(NASA-CR-146836; E-18-609-1) Avail: NTIS HC $5.00 CSCL 11D

The feasibility of space processing unidirectionally solidified oxide-metal composites was studied. It was determined that oxide-metal composites having improved structual morphologies could be produced. A limited market survey was conducted which found a potential market for oxide-metal composite field emitters which could develop over the next 10 years. Potential application in electronics is discussed with reference to uses in electron guns for TV cameras and instant-on TV sets. A.K.

N76-22313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHANGES IN BORON FIBER STRENGTH DUE TO SURFACE REMOVAL BY CHEMICAL ETCHING
Robert J. Smith Washington Apr. 1976 21 p refs
(NASA-TN-D-8219; E-8635) Avail: NTIS HC $3.50 CSCL 11D

The effects of chemical etching on the tensile strength of commercial boron/tungsten fibers were investigated. Fibers with as-received diameters of 203, 143, and 100 micrometers were etched to diameters as small as 43 micrometers. The etching generally resulted in increasing fiber tensile strength with decreasing fiber diameter. And for the 203 micrometer fibers there was an accompanying significant decrease in the coefficient of variation of the tensile strength for diameters down to 89 micrometers. Heat treating these fibers above 1,173 K in a vacuum caused a marked decrease in the average tensile strength of at least 80 percent. But after the fibers were etched, their strengths exceeded the as-received strengths. The tensile strength behavior is explained in terms of etching effects on surface flaws and the residual stress pattern of the as-received fibers. Author

N76-22314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEN DEG OFF-AXIS TENSILE TEST FOR INTRALAMINAR SHEAR CHARACTERIZATION OF FIBER COMPOSITES
Christos C. Chamis and John H. Sinclair Washington Apr. 1976 34 p refs
(NASA-TN-D-8215; E-8577) Avail: NTIS HC $4.00 CSCL 11D

A combined theoretical and experimental investigation was conducted to assess the suitability of the 10 deg off-axis tensile test specimen for the intralaminar shear characterization of unidirectional composites. Composite mechanics, a combined-stress failure criterion, and a finite element analysis were used to determine theoretically the stress-strain variation across the specimen width and the relative stress and strain magnitudes at the 10 deg plane. Strain gages were used to measure the strain variation across the specimen width at specimen midlength and near the end tabs. Specimens from Mod-I/epoxy, T-300/epoxy, and S-glass/epoxy were used in the experimental program. It was found that the 10 deg off-axis tensile test specimen is suitable for intralaminar shear characterization and it is recommended that it should be considered as a possible standard test specimen for such a characterization. Author

N76-22315*# Battelle Columbus Labs., Ohio.
FUNDAMENTAL ANALYSIS OF THE FAILURE OF POLYMER-BASED FIBER REINFORCED COMPOSITES Final Report
M. F. Kanninen, E. F. Rybicki, W. I. Griffith, and D. Broek Apr. 1976 49 p refs
(Grant NsG-2038)
(NASA-CR-2689) Avail: NTIS HC $4.00 CSCL 11D

A mathematical model is described which will permit predictions of the strength of fiber reinforced composites containing known flaws to be made from the basic properties of their constituents. The approach was to embed a local heterogeneous region (LHR) surrounding the crack tip into an anisotropic elastic continuum. The model should (1) permit an explicit analysis of the micromechanical processes involved in the fracture process, and (2) remain simple enough to be useful in practical computations. Computations for arbitrary flaw size and orientation under arbitrary applied load combinations were performed from unidirectional composites with linear elastic-brittle constituent behavior. The mechanical properties were nominally those of graphite epoxy. With the rupture properties arbitrarily varied to test the capability of the model to reflect real fracture modes in fiber composites, it was shown that fiber breakage, matrix crazing, crack bridging, matrix-fiber debonding, and axial splitting can all occur during a period of (gradually) increasing load prior to catastrophic fracture. The computations reveal qualitatively the sequential nature of the stable crack process that precedes fracture. Author

N76-22316# Rock Island Arsenal Lab., Ill. Thomas J. Rodman Lab.
IMPROVED MANGANESE PHOSPHATE COATINGS
Henry Crain Apr. 1975 24 p
(DA Proj. 1T0-62105-A-328)
(AD-A018131; RIA-R-TR-75-034) Avail: NTIS CSCL 11/3

Work was conducted to determine the mechanism by which superior manganese phosphate coatings are produced. The phosphate coatings were applied at temperatures above 212 F and with manganese-organic compounds added to the phosphating solution. Experimental baths and solubility studies have shown that the manganese concentration in the bath is critical and that the main function of the manganese-organic compounds is to increase the manganese concentration. The necessity of a processing temperature higher than 212 F has been attributed to an exponential increase in the reaction rate constant with temperature for the conversion of manganese dihydrogen phosphate ($Mn(H_2PO_4)_2$) to manganese phosphate ($Mn_3(PO_4)_2$). Author (GRA)

N76-22317# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
MECHANICS OF COMPOSITE MATERIALS WITH DIFFERENT MODULI IN TENSION AND COMPRESSION Interim Report
Robert M. Jones Jul. 1975 42 p refs
(Grant AF-AFOSR-2532-73)
(AD-A017683; AFOSR-75-1519TR) Avail: NTIS CSCL 11/4

Composite materials have been used for several years in thermal protection systems such as reentry vehicle nosetips and heatshields as well as in more conventional aerospace structures such as laminated wings and stabilizers in the latest aircraft. Many composite materials, e.g., ATJ-S graphite, carbon/carbon, and graphite/epoxy, exhibit different strength and stiffness behavior in tension and compression. The moduli differences range from 20% for ATJ-S graphite to between 100% and 400% for carbon/carbon. The principal objective of the research is to analyze the behavior of solid bodies with different elastic moduli in tension and compression as well as the behavior of laminated plates and shells that have different elastic moduli in tension and compression and lamination asymmetries. GRA

N76-22318# Analy-Syn Labs., Inc., Paoli, Pa.
MODIFIED COMPOSITE STRUCTURES
Jun. 1975 15 p
(Contract N00024-73-C-7553)
(AD-A018081) Avail: NTIS CSCL 11/4

One of the principal failure modes of fiber-reinforced resins is interlaminar shear. This task addresses a possible solution to this defect by linking the laminate plies with fibers inserted through the plies in a direction normal to the surface of the laminate. The present task proposes to simplify the vertical threading step in 3-D type fabric structures by a procedure akin to the 'hooking' of rugs hereinafter described by the more generic term of 'needling'. The needling process appears entirely feasible for introducing vertical fibers in rows as close as 1/8 in. apart. Two types of standard industrial sewing machines were used, each operating without the interlocking thread reel (bobbin) beneath the machine's table. No consistent benefit from the

needling treatment could be demonstrated in the cured laminates using ASTM flex and shear tests as criteria. GRA

N76-22319# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Space and Missiles Branch.
REENTRY VEHICLE NOSETIP STRESS ANALYSIS
Robert M. Jones and John R. Koenig Aug. 1975 38 p refs (AF Proj. 7381)
(AD-A018244) Avail: NTIS CSCL 16/4

The design analysis problems for graphite and carbon-carbon reentry vehicle nosetips in ballistic and maneuvering trajectories are outlined. The ultimate objective is computer programs for prediction of the thermal and mechanical stress behavior of such nosetips. The steps for qualifying computer programs to attain the objective are discussed in the context of necessary laboratory experiments through flight tests. Present nosetip stress analysis computer programs are characterized, and material behavioral characteristics not properly treated are identified. Some of the problem areas are different tensile and compressive moduli; nonlinear orthotropic behavior including biaxial softening (substantially increased strains under biaxial tensile loading opposed to uniaxial loading); macroscopic inhomogeneity and asymmetry of carbon-carbon nosetips; incompletely characterized materials; and inadequate failure criteria. Future nosetip stress analysis capabilities are speculatively predicted. GRA

N76-23102* California Univ., Los Angeles.
HALIDE EUTECTIC GROWTH EXPERIMENT MA-131
A. S. Yue, B. K. Yue, and J. Y. M. Lee *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 8 p refs (For availability see N76-23074 13-88)
CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N76-22320 California Univ., San Diego.
LAMINAR FLAME SPREAD OVER FLAT SOLID SURFACES Ph.D. Thesis
Angel Fernandez-Pello 1975 251 p
Avail: Univ. Microfilms Order No. 76-7806

From the experimental results, a theoretical model was developed which is capable of predicting rates of flame spread. Polymethyl methacrylate (PMMA) was selected because its burning mechanisms are orderly and reproducible and its properties are simpler and better understood than those of other fuels. Most of the experiments were conducted with flat, cast sheets of PMMA, typically 15 cm wide and 30 cm long, with thicknesses ranging from 1/32 to 6 inches. Rates of spread were measured for flame propagation in directions ranging from vertically downward to horizontal. Since the vertically downward spread process is the most reproducible of them all, a large part of this study was conducted for this configuration only. In an effort to define the dominant mode of heat transfer from the burning portion of the solid to the unignited material, temperature profiles of the surface, solid-phase and gas-phase were measured by thermocouple probing.
Dissert. Abstr.

N76-22321 Toledo Univ., Ohio.
RESONANCE TUBE IGNITION OF METALS Ph.D. Thesis
Bert R. Phillips 1975 210 p
Avail: Univ. Microfilms Order No. 76-8722

An experimental program is presented which was carried out to determine if spontaneous fluid dynamic oscillations could create a hazard in gaseous oxygen flow systems by igniting metal contaminants. The particular fluid dynamic oscillation studied was the resonance tube phenomena as it was excited in a tee-shaped configuration. Pure aluminum was chosen as the candidate material for ignition. The oscillatory fluid dynamics in the tee-shaped configuration were evaluated in comparison with oscillations driven by choked convergent nozzles and were found to be markedly different. The oscillation frequency, wave amplitude, and mean pressure measured at the base of the resonance tube were correlated with the configuration geometry and the ratio of the inlet stagnation pressure to the pressure within the apparatus. The temperatures generated at the base of the resonance tube were well in excess of 1,000 F for both gaseous oxygen and nitrogen. Results show that aluminum in both powder and fiber form was readily ignited, and it was concluded that resonance tube oscillations, constitute a real hazard in flow systems. Dissert. Abstr.

N76-22322 State Univ. of New York, Buffalo.
AN INVESTIGATION ON THE COUPLED GAS-SOLID REACTIONS Ph.D. Thesis
Chun-i Lin 1975 255 p
Avail: Univ. Microfilms Order No. 76-9081

A formulation was developed for coupled gas-solid reactions based on a grain model. The reactions of NiO, C, CO, and CO2 were chosen to verify the model in the temperature range 850 C - 954 C. The reactions of nickel oxide with carbon monoxide and of carbon with carbon dioxide were studied in the temperature ranges of 847 C - 1,099 C and 819 C - 1,081 C, respectively. The kinetic data obtained for the reaction of carbon with carbon dioxide were found not to be useful for the prediction of the behavior of the coupled reactions because the nickel produced during the reaction changed the mechanism and the rate of the solution-loss reaction. Experiments were also conducted to study the effects of reaction temperature, pellet size, molar ratio of carbon to nickel oxide and the ratio of carbon dioxide to carbon monoxide in the bulk gas stream on the overall conversion.
Dissert. Abstr.

N76-22323* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NULLING DEVICE FOR DETECTION OF TRACE GASES BY NDIR ABSORPTION Patent
John Dimeff, inventor (to NASA) Issued 27 Apr. 1976 5 p Filed 22 Nov. 1974 Supersedes N75-12275 (13 - 03, p 0297)
(NASA-Case-ARC-10760-1; US-Patent-3,953,734; US-Patent-Appl-SN-526438; US-Patent-Class-250-343; US-Patent-Class-250-344; US-Patent-Class-250-432R) Avail: US Patent Office CSCL 07D

A nondispersive gas analyzing apparatus is described having a first chamber for containing a first gas, the density of which is determined. A source of radiant energy is provided for passing radiant energy through the first chamber. Modulation means are provided for modulating the radiant energy passing through the first chamber by modulating the volume of the chamber at the acoustic resonance frequency of the first gas and the chamber. Signal generating means, including a second chamber for containing a gas which is heated by radiant energy emerging from the first chamber and a microphonic means responsive to the resulting pressurization in the second chamber, is provided for generating a signal, having a frequency and amplitude corresponding to the modulation of the radiant energy in the first chamber. Official Gazette of the U.S. Patent Office

N76-22324*# Scientific Translation Service, Santa Barbara, Calif.
MECHANISTIC VELOCITY EQUATIONS: A CRITICAL REVIEW USING THE EXAMPLE OF THE BOUDOUARD REACTION
Arno Loewe Washington NASA Apr. 1976 6 p refs Transl. into ENGLISH from Chem.-Ing.-Tech. (West Germany), v. 46, no. 15, 1974 p 651
(Contract NASw-2791)
(NASA-TT-F-16996) Avail: NTIS HC $3.50 CSCL 07D

The information content of mechanistic velocity equations, which were used for solving reaction kinetics problems of CO2 and C, is discussed according to two categories: (1) accuracy of the parameters and (2) validity of models. The accuracy has a defect because first reaction velocities were calculated (for differential evaluation) from primary measurement data (throughputs, concentrations, etc.), and the parameters were only calculated in the third state. When the primary data are encoded in this

way, the measurement error under some conditions can be enlarged considerably. The error propagation (using statistical methods) was studied for the reaction kinetics of the gasification reaction CO2 + C = 2CO. The good correlation capacity of mechanistic velocity equations was confirmed by the present investigation. Author

N76-22325*# Kanner (Leo) Associates, Redwood City, Calif.
REMOVAL OF FUEL GASES FROM THE OXYGEN ZONE DURING THE COMBUSTION OF CARBON
S. V. Kaftanov and Z. Z. Chukhanov Washington NASA Apr. 1976 23 p refs Transl. into ENGLISH from Khim. Tverd. Topliva (USSR), no. 4, 1970 p 97-108
(Contract NASw-2790)
(NASA-TT-F-17002) Avail: NTIS HC $3.50 CSCL 21B

Studies of a process for removal of CH4 and CO from the O zone, and reaction with C and O, provided a mechanism for combined action > 900 deg and during flame formation. The Kh number which determined the minimum value for the draft rate was analyzed theoretically. Above this value, flames of the fuel gases are not formed, and these gases can be removed from the O zone under different conditions of combustion within a carbon channel, hole, or dense layer of fine particles. Theoretical concepts were confirmed experimentally for CH4 and CO. The upper limit for the dense layer was determined theoretically. Removal of the gases formed during combustion and supplied to the draft is generally not possible under some temperature conditions for carbon particle size > 10-25 mm. Regions for this removal were defined for the combined combustion of C with other materials. Author

N76-22326# Royal Aircraft Establishment, Farnborough (England).
ELECTROCHEMICAL IMPREGNATION OF NICKEL HYDROXIDE INTO A POROUS NICKEL PLATE
T. Takamura, T. Shirogami, and T. Nakamura Jan. 1976 15 p refs Transl. into ENGLISH from Denki Kagaku (Japan), v. 42, no. 11, 1974 p 582-588 Presented at 14th Symp. on Batteries, Osaka, Nov. 1973
(RAE-Lib-Trans-1875; BR51461) Avail: NTIS HC $3.50

The impregnation of nickel hydroxide into the porous nickel electrode was investigated by the electrochemical reduction method of nickel nitrate solution at varied concentrations and cathodic current densities. The amount of nickel hydroxide impregnated was estimated from the capacity of a nickel cadmium cell constructed with the prepared plate. Contrary to the results so far reported, under an appropriate condition the capacity exceeded that which was obtained by a conventional technique. The amount of nickel hydroxide impregnated was strongly dependent on current density and concentration of nickel nitrate. The rechargeability of the prepared nickel electrode was satisfactory. The mechanism of the impregnation is discussed in terms of the formation of ammonia by the reduction of nitrate. Author

N76-22327*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
TEMPERATURES AND CONCENTRATIONS DURING FUEL PARTICLE COMBUSTION
T. V. Vilenskiy, M. M. Pogosyan, and D. M. Khzmalyan Washington NASA Apr. 1976 8 p refs Transl. into ENGLISH from Tr. Mosk. Energ. Inst. (Moscow), no. 150, 1972 p 50-54
(Contract NASw-2789)
(NASA-TT-F-16963) Avail: NTIS HC $3.50 CSCL 21B

Differential equations are presented that depict the combustion of spherical particles, initial and limiting parameters, and equilibrium ratios associated with oxygen concentrations and combustion products. Calculated data are compared with experimental data for the combustion of 250 micron authracite particles. Author

N76-22328*# Kanner (Leo) Associates, Redwood City, Calif.
RETENTION OF ETHYLENE OXIDE BY POLYVINYL CHLORIDE AND POLYETHYLENE MATERIALS AFTER STERILIZATION
M. Lacomme, G. LeMoan, and M. Chagneau Washington NASA Mar. 1976 13 p refs Transl. into ENGLISH from Ann. Pharm Franc. (France), v. 33, no. 6-7, 1975 p 337-344
(Contract NASw-2790)
(NASA-TT-F-16962) Avail: NTIS HC $3.50 CSCL 07D

The retention is discussed of ethylene oxide after its use in sterilization which varies with time, depending on the sterilization process used, the composition of the polymer, the quantities of additives used, the physicochemical characteristics of the materials, and the nature of the packaging. The measurement of the residual gas, whose concentration should not exceed 2 ppm for any object intended for introduction into the body is recommended. Author

N76-22329*# Transemantics, Inc., Washington, D.C.
PRIMARY OXIDES OF CARBON BURNING
N. V. Lavrov NASA Apr. 1976 7 p refs Transl. into ENGLISH from Khim. Tverd. Topliva (USSR), no. 3, 1972 p 140-142
(Contract NASw-2792)
(NASA-TT-F-17003) Avail: NTIS HC $3.50 CSCL 20B

A theoretical conception of carbon burning is developed based on the following three physiochemical laws: the oxidizing agent dissociates during the burning process; atomic oxygen forms intermediate compounds with the fuel; and the composition of the primary products of burning depends on the chemical structure of the intermediate compound. Graphitic C gave CO and CO + CO2 in dry and wet burning conditions, respectively, through complex intermediates, whereas diamond and atomic C gave CO2 and CO through C4H3 and HCHO (for CH4) respectively, as suggested by a metal carbide. Author

N76-22330*# Boeing Commercial Airplane Co., Seattle, Wash.
EVALUATION OF MATERIALS AND CONCEPTS FOR AIRCRAFT FIRE PROTECTION Final Report
Roy A. Anderson, James O. Price, Allan H. McClure, and Everett A. Tustin Apr. 1976 38 p refs
(Contract NAS2-7978)
(NASA-CR-137838; D6-42614) Avail: NTIS HC $4.00 CSCL 21B

Woven fiberglass fluted-core simulated aircraft interior panels were flame tested and structurally evaluated against the Boeing 747 present baseline interior panels. The NASA-defined panels, though inferior on a strength-to-weight basis, showed better structural integrity after flame testing, due to the woven fiberglass structure. Author

N76-22331# Technische Univ., Berlin (West Germany). Ehemaliger Lehrstuhl fuer Ueberschalltechnik.
STABILITY OF CHEMICAL REACTIONS IN A STAGNATION POINT BOUNDARY LAYER EXEMPLIFIED FOR CARBON COMBUSTION
Werner Haase Cologne DFVLR 1976 72 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-03) Avail: NTIS HC $4.50; DFVLR, Cologne DM 27.90

Based on the unsteady-state boundary layer equations similar solutions for a stagnation-flow problem are given. The system of unsteady equations consists of the balance equations for momentum, energy and conservation of the i-th species. The numerical solutions due to a C-O reaction include heterogeneous surface reactions as well as homogeneous gas phase reactions, both associated with the backward reactions. In contrast to a linear stability-theory which is limited in scope because the analysis is based on linearized equations and, consequently, gives only a description for the response to very small disturbances, large-scale reaction phenomena are presented as well as frequencies and amplitudes of temperature and concentration oscillations. Author (ESA)

N76-22332# North Dakota Water Resources Research Inst., Fargo.
INTERACTIONS OF METALS AND SIMPLE OXYANIONS IN WATER
John Knoeck Apr. 1975 22 p refs
(Contract DI-14-31-0001-3627)
(PB-248077/0; W1-222-009-75; W76-02633; OWRT-B-016-NDAK(1)) Avail: NTIS HC $3.50 CSCL 07B

The infrared and Raman spectra of ammonium and potassium salts of dithiocarbamate and dithiocarbamate-d2 anions were obtained and the 9 in plane and 3 out of plane fundamental vibrational frequencies were assigned for the anions in the C2y

point group. A single least squares converged Urey-Bradley force field was developed for both isotopic species and was compared to force fields for metal complexed dithiocarbamates. Although 23 vibrational fundamentals were assigned a single unique set of 14 Urey-Bradley type force constants could not be found. This observation was attributed to a high degree of correlation in certain combinations of force constants. GRA

N76-22333# National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
PHYSICAL AND CHEMICAL PROPERTIES OF AgI AEROSOLS FORMED AT SIMULATED AIRBORNE CONDITIONS
F. P. Parungo, R. F. Pueschel, B. T. Patten, and D. Eyre Sep. 1975 51 p refs
(PB-247909/5; NOAA-TR-ERL-337; NOAA-75112003) Avail: NTIS HC $4.50 CSCL 07D

AgI cloud-seeding nuclei were produced in a wind tunnel by both a flame generator and pyrotechnic at simulated aircraft speeds (150 to 200 mph). These aerosols were collected with isokinetic and anisokinetic samplers. By using electron-microscope combined with X-ray energy spectrometer, the particles size shape, chemical composition, photostability, and hygroscopicity was determined. The relationship between these properties and the AgI aerosols' effectiveness as sublimation, condensation-freezing, and contact nuclei was also studied. A new method was developed from this study of the existing aerosol-generating methods: combusting solid AgI in a flame generator. It was found that the aerosol's size distribution, chemical arrangement, and physical properties can be controlled. GRA

N76-22334# Sussex Univ., Brighton (England).
EXPERIMENTS ON THE FORMATION AND SURFACE STATES OF ADSORBED HELIUM FILMS Final Technical Report, Jan. - Dec. 1974
D. F. Brewer Apr. 1975 76 p refs
(Grant DA-ERO-124-74-G0046; DA Proj. 2C0-61102-B-11B)
(AD-A011418; ARDG(E)-R/D-2092) Avail: NTIS CSCL 07/4

Progress made in the investigation of phases of He3 and He4 adsorbed on Vycor porous glass at low temperatures is reported. The main experimental effort was the exploration of problems associated with the apparatus used for the three main branches of the work: density of adsorbed helium; nuclear magnetic resonance properties of He2 and He3-He4 films; and a novel form of Pomeranchuk refrigeration using adsorbed helium. In addition, an extensive consideration of the magnetic properties of monolayer and submonolayer films is given. GRA

N76-22335# Union Carbide Corp., Tuxedo, N.Y. Sterling Forest Research Center.
A NEUTRON SCATTERING STUDY OF WATER AND IONIC SOLUTIONS - 1967, FIRST REPORT Research and Development Progress Report
G. J. Safford, A. W. Naumann, and P. C. Schaffer Sep. 1967 140 p refs Sponsored by Dept. of Interior
(PB-248718/9; Int-OSW-PR-280; W76-03260) Avail: NTIS HC $6.00 CSCL 07D

The spectroscopic technique of neutron inelastic scattering was used to examine the bonding and diffusive motions of H2O molecules in water and certain ionic solutions in an effort to relate them to models of the water structure and its modification by ions. Measurements of the vibrational spectra of water were made from 1C to 95C. Information on the type of changes induced in the water structure by ions was obtained from studies of the intermolecular frequencies in salt solutions. The data show that a reduction in temperature (i.e. to 1C) increases the residence time, decreases the diffusion constant, and intensifies any frequencies characteristic of a solid hydrate. While distinct variations occur in the vibrational spectra of water molecules due to ions in solutions, the variation in the average vibrational period with temperature is not large. GRA

N76-22336# Office of Saline Water, Washington, D.C.
NEW POLYMERS FOR DESALINATION MEMBRANES Final Report, 1 Sep. 1973 - 31 Aug. 1974
Otto Vogl and David A. Tirrell, ed. 1974 47 p refs
(PB-248668/6; W76-03258; OWRT/S-76/3) Avail: NTIS HC $4.00 CSCL 07A

The development of materials and techniques which will allow the formulation of membranes suitable for use in desalination by reverse osmosis is described. Major emphasis was placed on actual reverse osmosis testing of candidate materials and on obtaining a more thorough fundamental understanding of the physical properties of these materials. The major difficulty encountered in the fabrication of asymmetric membranes from copolyamides is their limited solubility in good casting solvents. The effects of the incorporation of additional comonomers on the solubility and desalination performance of these materials were investigated. GRA

N76-22337# Coordinating Research Council, Inc., New York.
COOPERATIVE EVALUATION OF TECHNIQUES FOR MEASURING HYDROCARBONS IN DIESEL EXHAUST. PHASE 4, 1972 - 1973 Final Report
Nov. 1975 39 p refs
(PB-248187/7; CRC-471; CRC-APRAC-CAPI-1-64-9) Avail: NTIS HC $4.00 CSCL 07D

A multi-cylinder diesel generating set was circulated among 15 participating laboratories, and each laboratory measured exhaust hydrocarbons by methods that complied with the SAE Recommended Practice J215, Continuous Hydrocarbon Analysis of Diesel Exhaust. They also measured hydrocarbon concentrations of two bottled gases having unknown compositions. Analyses were fairly consistent within laboratories both on bottled gases and engine exhaust; the standard deviations were three percent and 10 percent of the grand averages, respectively. However, analyses differed substantially among laboratories both on bottled gases and engine exhaust; the standard deviations were about 10 percent and 22 percent of the grand averages, respectively. GRA

N76-22338# Air Force Civil Engineering Center, Tyndall AFB, Fla.
EFFICIENCY OF SILVER RECOVERY FROM AIR FORCE PHOTOGRAPHIC OPERATIONS Final Report, Aug. 1974 - Jun. 1975
Brian D. Bennett Jul. 1975 34 p refs
(AF Proj. 2054)
(AD-A018219; AFCEC-TR-75-11) Avail: NTIS CSCL 07/1

In order to ascertain the efficiency of the silver recovery techniques presently employed at United States Air Force photographic processing facilities, a field sampling program was undertaken to obtain actual performance data. Since silver recovery by metallic replacement utilizing cartridges was found to be the most frequently applied method of recovery, emphasis was placed on this recovery technique. An electrolytic recovery tailing operation was also sampled to determine the efficiency of recovery utilizing this technique. Results of this study are reported in terms of cartridge performance with time, Volume of fix processed, and average silver loading. Data reflect actual in-the-field efficiencies and indicate that effective silver recovery techniques are available for Air Force application. Author (GRA)

N76-22339# California Univ., Santa Cruz.
MECHANISMS OF ORGANIC PHOTOREACTIONS Final Technical Report, 7 Jan. 1972 - 30 Jun. 1975
George S. Hammond 18 Aug. 1975 9 p refs
(Grant DA-ARO(D)-31-124-72-G202)
(AD-A018549; ARO-11138.1-C) Avail: NTIS CSCL 07/5

Several organic photoreaction mechanisms were studied. New methods were developed for measurement of intersystem crossing efficiencies and have done several studies of effects of structural variation on the rates of photophysical processes. GRA

N76-22340# New Orleans Univ., La. Dept. of Chemistry.
PHOTOCYCLOELIMINATION REACTIONS OF A VARIETY OF HETEROCYCLIC SYSTEMS Final Report, 1 Aug. 1972 - 31 Jul. 1975
Gary W. Griffin 31 Jul. 1975 35 p refs
(Grant DA-ARO(D)-31-123-73-G4)
(AD-A018472; ARO-1005.8-C) Avail: NTIS CSCL 07/5

Recent advances in elaborating the mechanisms of photocycloelimination reactions in oxiranes, cyclic carbonates, cyclic sulfites, 1,3,2-dioxo-P-phospho-lane, and 1,3-dioxalanes are discussed. Investigations used both esr and optical spectroscopy in rigid matrices and comparative chemical studies conducted at ambient temperature. GRA

N76-22341# Utah Univ., Salt Lake City.
STUDIES IN CHEMICAL IONIZATION MASS SPECTROMETRY Final Report
Jean H. Futrell Mar. 1975 283 p refs
(Contract F33615-73-C-5025; AF Proj. 7360)
(AD-A018355; AFML-TR-75-35) Avail: NTIS CSCL 07/4

These research efforts have involved studies in chemical ionization mass spectrometry which have led to improved instrumentation, techniques and methodology for trace analysis. Much of the work has emphasized instrumental developments. These have included the development of high pressure ion sources for chemical ionization studies with a high resolution mass spectrometer, the development of super pressure (20 torr) ion sources for exploring maximum sensitivity of chemical ionization mass spectrometry, and, most recently, the development of combined gas chromatography-electron impact-chemical ionization mass spectrometry using a dual source, dual-beam mass spectrometer. This report describes some applications of the latter instrument plus the computer software developed for accumulation of data and data reduction. Author (GRA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N76-22342 Iowa Univ., Iowa City.
ELECTROREFLECTANCE OF SINGLE CRYSTAL METALS Ph.D. Thesis
Thomas Elton Furtak 1975 159 p

Measurements of the normal incidence, polarized light electroreflectance of clean, strain free (110) and (100) Ag, from 3 eV to 4.2 eV, and (110) Au, from 1.6 eV to 4.0 eV, were performed using the electrolyte technique in a novel drop configuration. At 3.9 eV in Ag a dramatic reproducible anisotropy in the negative peak in i/R delta R/delta phi, that was unquestionably correlated with the orientation of the crystal, was observed only on the (110) face. No anisotropy was detected in the electroflectance of Au. A detailed study of the anisotropic spectrum was conducted as a function of surface preparation, solution composition, sample bias potential, and modulation amplitude. The results demonstrated beyond doubt that the electroreflectance on the (110) surface of Ag involves a modulation of electron states that possess the crystal surface symmetry. Dissert. Abstr.

N76-22343 Texas Univ., Austin.
MORPHOLOGICAL EFFECTS ON THE THERMAL STABILITY OF EUTECTIC STRUCTURES AT ELEVATED TEMPERATURES Ph.D. Thesis
Lawrence Yuan-Chi Lin 1975 114 p
Avail: Univ. Microfilms Order No. 76-8065

Morphological effects on the elevated temperature stability of Pb-Sn and Cu-Cr directionally solidified eutectics were investigated at temperatures of 150 C and 900 C to 1000 C, respectively. In the Pb-Sn lamellar eutectic system, the migration velocity of an isolated termination fault in as-grown specimens was directly determined and compared well with the predicted theoretical values. Substructural changes caused by cold rolling lead to formation of more faults during the subsequent annealing process. Since the lamellar structures are intrinsically shape stable, the initial coarsening is due to a fault migration mechanism. Good correlations between the initial coarsening rate and the fault density were obtained using a two dimensional fault migration coarsening model. In the Cu-Cr fibrous eutectic system, the elevated temperature stability is highly dependent upon the extent of structural defects of the as-grown eutectics. Dissert. Abstr.

N76-22344 Syracuse Univ., N.Y.
A NEW MEANS OF CRACK DETECTION USING BARKHAUSEN EFFECT TYPE MEASUREMENTS Ph.D. Thesis
John Casper McClure, Jr. 1975 140 p
Avail: Univ. Microfilms Order No. 76-7705

When a ferromagnet is magnetized its magnetization changes by a series of small discrete steps known as Barkhausen discontinuities. The Barkhausen Effect has suggested a new method of detecting real time crack propagation in ferromagnetic samples. When a crack grows under applied stress, a small amount of material is removed from the vicinity of the crack. If the sample is magnetized there will be a change in magnetic moment during crack propagation which can be detected on a pick up coil in the same way that Barkhausen discontinuities can be detected. Fracture mechanics can be used to calculate the change in compliance of the specimen as the crack grows. Such measurements were performed on both tensile and fatigue cracks. The excellent agreement between theory and experiment suggests that the Barkhausen Effect method of crack detection holds promise of becoming one of the standard methods of non-destructive crack detection. Dissert. Abstr.

N76-22345 Syracuse Univ., N.Y.
DETECTION OF FATIGUE CRACK PROPAGATION IN FERROMAGNETIC MATERIALS BY BARKHAUSEN EFFECT TYPE OF MEASUREMENTS Ph.D. Thesis
Somnath Bhattacharya 1975 122 p
Avail: Univ. Microfilms Order No. 76-7634

A new method is developed for detecting fatigue crack propagation in ferromagnetic specimens. This method is similar to the Barkhausen effect type of measurement in magnetism where discontinuous voltage pulses are induced in a pick-up coil surrounding a specimen as the specimen is magnetized slowly. The voltage pulses are due to flipping of individual magnetic domains in the material. As a fatigue crack grows similar voltage pulses are generated. Simultaneous monitoring of the Barkhausen effect type of magnetic signals and the acoustic emission signals during fatigue crack propagation show that they are correlated. In some cases for hard and brittle specimens (HRC > 50) the sensitivity of the magnetic signal technique is approximately 1 micron of crack growth which is superior to the sensitivity of 50 micron usually reported for acoustic emission measurements. Use of Squid system will lead to a substantial increase in the crack detection sensitivity by the magnetic signal technique. Dissert. Abstr.

N76-22346 Syracuse Univ., N.Y.
FRACTURE RESISTANCE OF METALS AND ALLOYS Ph.D. Thesis
Mukulesh Sengupta 1974 191 p
Avail: Univ. Microfilms Order No. 76-7938

An analytical solution is developed on the basis of a critical mean stress fracture criterion for the stress state effect on fracture ductility and the Hencky von Mises theory on flow stress. This results in a general closed form correlation between fracture toughness and fundamental properties, namely yield strength, strain hardening exponent, a critical length constant and a fracture ductility determined for a definitely known stress state. The tests consisted of biaxial ductility tests, notch tensile tests and fracture toughness tests. An analysis of the onset of instability in various biaxial ductility tests showed that for the materials tested necking intervenes before fracture in the simple tension, the bend and the plane strain tension test. The original stress state is maintained only for the hydraulic bulge test and the fracture strain obtained in this test is recommended for fracture toughness-ductility correlation. Dissert. Abstr.

N76-22347 State Univ. of New York, Buffalo.
ROLE OF LOW MELTING ADDITIVES IN FREE MACHINING STEELS Ph.D. Thesis
Kunal Basu 1975 177 p
Avail: Univ. Microfilms Order No. 76-9028

The extent of deformation of MnS inclusions during machining is measured for resulfurized steels both with and without Pb and Pb-Te additions. The extent of deformation of MnS inclusions is determined by comparing the aspect ratios of these inclusions in the parent materials and in the chips produced. The chips produced cover a wide range of cutting speeds from 20 sfpm to 504 sfpm. Varying the cutting speed over this wide range of conditions, changes machining temperatures and strains for chip formation. The results show that the addition of Pb and Pb-Te to resulfurized steels greatly affects the extent of deformation of the MnS particles. Dissert. Abstr.

N76-22348 Michigan Univ., Ann Arbor.
PRECIPITATION KINETICS OF COLUMBIUM CARBONI-

TRIDE IN AUSTENITE OF HIGH STRENGTH LOW-ALLOY STEEL Ph.D. Thesis
Hideki Watanabe 1975 144 p
Avail: Univ. Microfilms Order No. 76-9538

Time-temperature-precipitation diagrams of columbium carbonitride were determined in an investigation of the effects of deformation and molybdenum, nitrogen and aluminum contents on the precipitation kinetics in austenite. Processing of the steel involved reheating small plates to 2300 F (1260 C), grain refining by hot-rolling, mist-jet cooling to the precipitation temperature 1500 to 1700 F (815 to 925 C), isothermal holding, and quenching into brine. Quantitative analysis was performed by electrolyte extraction of the columbium carbonitride in a 3% ferric chloride-7% hydrochloric acid-ethylene glycol solution and determining the amount of columbium in the residue. The isothermal percipitation of columbium carbonitride was slow in the absence of deformation and was accelerated by prior deformation. The addition of molybdenum (0.29%) to the steel lowered the nose of the C-curve to about 1630 F(890 C), where the influence of molybdenum in acclerating precipitation was significant.
Dissert. Abstr.

N76-22349 Cornell Univ., New York.
STUDY OF POINT DEFECTS IN QUENCHED TUNGSTEN BY ELECTRICAL RESISTIVITY MEASUREMENTS Ph.D. Thesis
Hung-Chang-Ward Huang 1975 114 p
Avail: Univ. Microfilms Order No. 76-8170

A series of high purity single crystal tungsten rods from different sources was prepared by systematically increasing the number of electron beam zone-melting passes in vacuum while keeping the other operating parameters constant. Thin single crystal specimen wires of dia. 66-122 micrometers were obtained from these rods by electropolishing. The quenched-in resistivity increments decreased markedly as the expected specimen purity increased. Although very low quenched-in defect concentrations were detected in the most pure specimen, the question of what fraction of these defects was vacancies and what fraction was impurity atoms remains unanswered. The only positive evidence which exists in the literature that any vacancies are indeed quenched into tungsten is the experiment of Kunz in which Stage I annealing in electron irradiated tungsten was found to be enhanced in previously quenched specimens. Dissert. Abstr.

N76-22350*# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
DEVELOPMENT AND STUDY OF CHEMICAL VAPOR DEPOSITED TANTALUM BASE ALLOYS Final Report
Gerald H. Meier and William A. Bryant 1 Mar. 1976 53 p refs
(Grant NGR-39-011-164)
(NASA-CR-134965) Avail: NTIS HC $4.50 CSCL 11F

A technique for the chemical vapor deposition of alloys was developed. The process, termed pulsing, involves the periodic injection of reactant gases into a previously-evacuated reaction chamber where they blanket the substrate almost instanteneously. Formation of alternating layers of the alloy components and subsequent homogenization allows the formation of an alloy of uniform composition with the composition being determined by the duration and relative numbers of the various cycles. The technique has been utilized to produce dense alloys of uniform thickness and composition (Ta- 10 wt % W) by depositing alternating layers of Ta and W by the hydrogen reduction of TaCl5 and WCl6. A similar attempt to deposit a Ta - 8 wt % W - 2 wt% Hf alloy was unsuccessful because of the difficulty in reducing HfCl4 at temperatures below those at which gas phase nucleation of Ta and W occurred. Author

N76-22351# Royal Aircraft Establishment, Farnborough (England).
PRACTICAL METHODS FOR THE DETERMINATION OF THE STRESS INTENSITY FACTOR FOR CRACK PROPAGATION
A. Monthulet and C. Riviere Feb. 1976 18 p refs Transl. into ENGLISH from Rech. Aerosp. (France), no. 5, 1971 p 297-303
(RAE-Lib-Trans-1879; BR51498) Avail: NTIS HC $3.50

Two methods, both based on strain gauge measurements, are used to obtain the stress intensity factor in fatigue cracked thin sheets. A comparison is presented of the results obtained on a simple case with those obtained in the case of a stiffened sheet. Author

N76-22352*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF STRAINRANGE PARTITIONING TO THE PREDICTION OF CREEP-FATIGUE LIVES OF AISI TYPES 304 AND 316 STAINLESS STEEL
James F. Saltsman and Gary R. Halford 1976 28 p refs Proposed for presentation at the Intern. Joint Pressure Vessels and Piping and Petroleum Mech. Eng. Conf., Mexico City, 19-23 Sep. 1976; sponsored by ASME
(NASA-TM-X-71898; E-8672) Avail: NTIS HC $4.00 CSCL 11F

As a demonstration of the predictive capabilities of the method of Strainrange Partitioning, published high-temperature, low cycle, creep-fatigue test results on AISI Types 304 and 316 stainless steel were analyzed and calculated, cyclic lives compared with observed lives. Predicted lives agreed with observed lives within factors of two for 76 percent, factors of three for 93 percent, and factors of four for 98 percent of the laboratory tests analyzed. Agreement between observed and predicted lives is judged satisfactory considering that the data are associated with a number of variables (two alloys, several heats and heat treatments, a range of temperatures, different testing techniques, etc.) that are not directly accounted for in the calculations. Author

N76-22353*# Scientific Translation Service, Santa Barbara, Calif.
STANDARDIZATION OF HIGH TEMPERATURE STEELS AND ALLOYS
Heinz Kiessler Washington NASA May 1976 17 p refs Transl. into ENGLISH from DEW Tech. Ber. (West Germany), v. 9, no. 2, 1969 p 110-117
(Contract NASw-2791)
(NASA-TT-F-17016) Avail: NTIS HC $3.50 CSCL 11F

The chemical compositions and tensile properties of high-temperature steels and alloys standardized as per Stahl-Eisen-Werkstoffblatt (steel-iron norm sheet) 670, DIN 17240, DIN 267 Sheet 13, Werkstoffhandbuch der Deutschen Luftfahrt (German Aviation Handbook), and the International Association of Aerospace Materials Designers are discussed. Author

N76-22354*# Kanner (Leo) Associates, Redwood City, Calif.
RECENT RESULTS OF CREEP TESTS ON HEAT-RESISTANT STEEL X22CrMoV 12.1
Gerhard Belka, Guenther Muench, and B. Melzer Washington NASA May 1976 16 p Transl. into ENGLISH of report from Czechoslovak conf. Presented at Intern. Symp. on Heat-Resistant Mater., 4th, Mala Fatra, Czechoslovakia, 6-9 Sep. 1971, Proc., v. 2 p 1932
(Contract NASw-2790)
(NASA-TT-F-17012) Avail: NTIS HC $3.50 CSCL 11F

The results of creep test programs carried out in factory laboratories in the German Democratic Republic on the heat-resistant steel X22CrMoV 12.1 are evaluated. Elongation and creep strength values are presented, as well as values for creep rupture strength and temper hardening. These results are compared with previously published GDR values and with the results obtained by laboratories in other countries. Author

N76-22355*# Pratt and Whitney Aircraft, East Hartford, Conn.
ALLOY AND STRUCTURAL OPTIMIZATION OF A DIRECTIONALLY SOLIDIFIED LAMELLAR EUTECTIC ALLOY
K. D. Sheffler May 1976 320 p refs
(Contract NAS3-17811)
(NASA-CR-135000; PWA-5300) Avail: NTIS HC $9.75 CSCL 11F

Mechanical property characterization tests of a directionally solidified Ni-20 percent Cb-2.5 percent Al-6 percent Cr cellular eutectic turbine blade alloy demonstrated excellent long time creep stability and indicated intermediate temperature transverse tensile ductility and shear strength to be somewhat low for turbine blade applications. Alloy and structural optimization significantly improves these off-axis properties with no loss of longitudinal creep strength or stability. The optimized alloy-structure combination is a carbon modified Ni-20.1 percent Cb-2.5

percent Al-6.0 percent Cr-0.06 percent C composition processed under conditions producing plane front solidification and a fully-lamellar microstructure. With current processing technology, this alloy exhibits a creep-rupture advantage of 39 C over the best available nickel base superalloy, directionally solidified MAR M200+ Hf. While improved by about 20 percent, shear strength of the optimized alloy remains well below typical superalloy values. Author

N76-22356*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADHESION AND FRICTION OF THIN METAL FILMS
Donald H. Buckley Washington Apr. 1976 19 p refs
(NASA-TN-D-8230; E-8565) Avail: NTIS HC $3.50 CSCL 11F

Sliding friction experiments were conducted in vacuum with thin films of titanium, chromium, iron, and platinum sputter deposited on quartz or mica substrates. A single crystal hemispherically tipped gold slider was used in contact with the films at loads of 1.0 to 30.0 and at a sliding velocity of 0.7 mm/min at 23 C. Test results indicate that the friction coefficient is dependent on the adhesion of two interfaces, that between the film and its substrate and the slider and the film. There exists a relationship between the percent d bond character of metals in bulk and in thin film form and the friction coefficient. Oxygen can increase adhesive bonding of a metal film (platinum) to a substrate. Author

N76-22357# Knolls Atomic Power Lab., Schenectady, N.Y.
EFFECT OF RADIATION ON THE DEFORMATION AND FRACTURE OF STRUCTURAL ALLOYS
C. E. Lacy Mar. 1975 20 p refs Presented at the Seminar on the Role of Environ. on Deformation and Fracture, Hudson, N. Y., 21 Apr. 1975
(Contract W-31-109-eng-52)
(KAPL-P-4022; Conf-750442-1) Avail: NTIS HC $4.00

The effects of radiation on reactor materials are described. Information and discussions are included on mechanisms of radiation damage, general effects of radiation on alloy properties, effects of radiation on stainless steel, and effects of radiation on reactor vessel steels. GRA

N76-22358# Sandia Labs., Livermore, Calif.
STRENGTH OF CONTROLLED DENSITY METAL POWDER COMPACTS
R. M. German Sep. 1975 33 p refs
(Contract AT(29-1)-789)
(SAND-75-8278) Avail: NTIS HC $4.75

The fabrication of controlled porosity microstructures through powder metallurgy is examined with regard to the density influence on rupture strength. A characteristic density dependence on the compaction pressure is established for powders which consolidate by a plastic deformation mechanism. For aluminum and iron powders, the strength is shown to be proportional to the compaction pressure to appoximately the first power. From a design standpoint, it is demonstrated that dual density and strength specifications inherently relate to the particle size. Thus, strength and density design criteria for porous materials can be accommodated through proper selection of particle size and compaction pressure. Author (ERA)

N76-22359# National Aerospace Lab., Amsterdam (Netherlands). Structures amd Materials Div.
HEAT TREATMENT STUDIES OF ALUMINIUM ALLOY TYPE 7050 FORGING. A PRELIMINARY INVESTIGATION ON THE EFFECT OF HEAT TREATMENT ON HARDNESS AND STRESS CORROSION RESISTANCE Interim Report
L. Schra and H. P. VanLeeuwen Aug. 1974 43 p refs Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-74119-U; IR-1) Avail: NTIS HC $4.00

The effect of heat treatment on hardness and stress corrosion resistance of small samples of aluminum alloy 7050 was studied. Also, heat treatment tests of 25 forgings to be cut up into a great variety of specimens for the determination of several engineering problems are discussed. It is concluded that stress corrosion properties of the alloy 7050 are far better than those of the aluminum forging alloys 7079 and DTD 5024, and are in the same range as those of the alloy AZ 74.61. ESA

N76-22360# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
HEAT TREATMENT STUDIES OF ALUMINIUM ALLOY FORGINGS OF THE AZ 74.61 TYPE. THE EFFECT OF HEAT TREATMENT ON A VARIETY OF ENGINEERING PROPERTIES Interim Report
L. Schra and H. P. vanLeeuwen Oct. 1974 106 p refs Sponsored by the Directorate of Mater. Air, RNLAF
(NLR-TR-74151-U; IR-2) Avail: NTIS HC $5.50

The effect of a variety of heat treatments on engineering properties such as Vickers hardness, short time tensile strength, fatigue crack propagation resistance, fracture toughness and stress corrosion resistance of AZ 74.61 type aluminum alloy forgings was studied. It was found that at comparable strength, crack tolerance properties were superior to those of the older aluminum forging alloys 7079 and DTD 5024. In particular, a better resistance to stress corrosion can be obtained with the present alloy. A further improvement in crack tolerance at the cost of only a slight loss in strength can be achieved if a secondary aging temperature of 180 deg is used instead of the 170 deg applied by Fuchs. Author (ESA)

N76-22361# Army Electronics Command, Fort Monmouth, N.J.
HYPERFINE FIELDS IN Nd2Co17, NdCo5 AND NdCo3
Oct. 1975 10 p refs
(DA Proj. 1T1-61102-B-31A)
(AD-A016917; ECOM-4361) Avail: NTIS CSCL 07/4

The nuclear magnetic resonances (NMR) of Co59, Nd143, and Nd145 have been studied at 4.2K in the compounds Nd2Co17, NdCo5, and NdCo3. Co hyperfine fields in these alloys are found to depend on both the alloy and the Co site within a given alloy and vary from 30 kG to 220 kG. The Nd hyperfine fields are found to be in the range from 3.4-4.0 MG. GRA

N76-22362# RCA Labs., Princeton, N.J.
BASIC ADHESION MECHANISMS IN THICK AND THIN FILMS Quarterly Technical Report, 7 Jan. - 30 Sep. 1975
Kenneth R. Bubble and Thomas T. Hitch 31 Oct. 1975 30 p refs
(Contract N00019-75-C-0145)
(AD-A017788; PRRL-75-CR-58; QTR-3) Avail: NTIS CSCL 11/6

During this quarter, the adhesion strengths between preglazed ceramic substrates and metal foils of gold, silver, and copper were measured. In addition, the adhesion strengths of gold and silver model inks were determined using a two-level method of application, i.e., sequential depositions of glass and metal inks with a preglazing step prior to firing the metal deposit. By comparing the total sintered metal adhesion strength with the chemically derived strength from the foil-glaze measurements, it was possible to ascertain the microstructural contribution. Variations in surface bondability were observed in both gold and silver after prolonged firing and/or at excessively high temperatures. This variation was consistent with the wetting and spreading results of E1527 glass on gold and silver presented in the last quarterly report. Chemical analyses of the commercial copper and silver inks are presented. GRA

N76-22363# Hughes Aircraft Co., Culver City, Calif.
RELATIONSHIP BETWEEN INTERGRANULAR CORROSION SUSCEPTIBILITY AND STRESS CORROSION RESISTANCE OF ALUMINUM ALLOY FORGINGS Final Report, Jul. 1974 - Sep. 1975
J. C. French, W. W. Jarrett, E. Y. Tsao, and J. M. Thorp Sep. 1975 101 p
(Contract DAAJ01-74-C-0590)
(AD-A017751; USAAWSXOM-75) Avail: NTIS CSCL 11/6

The objectives of the program were (1) to establish an emperical correlation between severity of intergranular corrosion and time to failure caused by stress corrosion. (2) To establish a maximum level of severity for intergranular corrosion in aluminum forgings that may be used as an acceptance criteria. GRA

N76-22364# Dayton Univ. Research Inst., Ohio.
MECHANICAL PROPERTY DATA FOR ALUMINUM ALLOY 2419-T851 PLATE Final Report, May 1974 - Jun. 1975
John J. Ruschau Sep. 1975 32 p refs

(Contract F33615-74-C-5024; AF Proj. 7381)
(AD-A018159; AFML-TR-75-136) Avail: NTIS CSCL 11/6

Tensile, fracture toughness, fatigue, fatigue crack growth, and stress corrosion properties for aluminum alloy/temper 2419-T851 two-inch-thick-plate were determined. The material was obtained from the Aluminum Company of America (ALCOA). Material property comparisons were then drawn between data developed from a single plate of the test alloy and aluminum alloy 2219 plate in the T851 heat treat condition. GRA

N76-22365# Bureau of Mines, Reno, Nev. Metallurgy Research Center.

RECOVERY AND SEPARATION OF MOLYBDENUM AND RHENIUM FROM A PROCESS SOLUTION

D. D. Fischer, D. J. Bauer, and R. E. Lindstrom Oct. 1975 18 p refs
(PB-247791/7; BM-RI-8088) Avail: NTIS HC $3.50 CSCL 07A

The process solution was accomplished by a technique involving a combined solvent extraction activated carbon adsorption procedure. The processing sequence required treatment of the solution with SO2 to reduce chlorate ion and adjust the ph prior to solvent extraction of Mo and Re with a tertiary amine. Mo and Re were stripped from the organic phase with an NH4OH solution, and the strip solution was passed through activated carbon to preferentially adsorb the Re. After washing entrained Mo from the column with a brine solution, Re was eluted with an MeOH-H2O mixture. The activated carbon was regenerated with water. Mo was recovered as (NH4)6Mo7024 by evaporation of the column effluent Re in the column eluate was re-extracted with a tertiary amine, stripped from the organic phase with dilute NH4OH, and recovered as NH4ReO4 by evaporation of the strip solution. GRA

N76-22366# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

LOW CYCLE FATIGUE CRACK INITIATION STUDY IN RENE 95 Final Report, Sep. 1972 - Sep. 1974

M. N. Menon and W. H. Reimann Apr. 1975 39 p refs
(AF Proj. 7351)
(AD-A018127; AFML-TR-75-1) Avail: NTIS CSCL 11/6

A microstructural study of fatigue deformation and cracking was conducted on Rene: 95 which is a thermomechanically processed superalloy developed for use as disks in advanced gas turbine engines. Optical, replica, scanning, and transmission electron microscopy were used in order to study the deformation structures and mode of cracking during crack initiation under low cycle fatigue. As in a previous tensile study, it was found that the deformation occurred very homogeneously throughout the material. This is believed to be due to the slip dispersive effect of the substructure in the warm worked grains and the very small size of the necklace grains. The study also showed that the number of load cycles to produce crack initiation can be strongly affected by brittle constituents of the microstructure, such as MC carbides. It was found that the specimens that had shorter lives were characterized by MC carbide cracking at the site of the crack initiation, whereas those which had longer lives under the same conditions of loading and temperature were characterized by only slip band cracking with no evidence of MC carbide cracking or decohesion in influencing the initiation. Author (GRA)

N76-22367# Battelle Columbus Labs., Ohio.

ENGINEERING DATA ON NEW AEROSPACE STRUCTURAL MATERIALS Final Summary Report, Apr. 1973 - Apr. 1975

Omar L. Deel, Paul E. Ruff, and H. Mindlin Jun. 1975 287 p
(Contract F33615-73-C-5073; AF Proj. 7381)
(AD-A017848; AFML-TR-75-97) Avail: NTIS CSCL 11/6

The major objectives of this research program were to evaluate newly developed materials of interest to the Air Force for potential structural airframe usage, and to provide 'data sheet' type presentations of engineering data for these materials. The effort covered in this report has concentrated on 7049-T7351 plate, Inconel 617 annealed sheet, 7475-T7351 plate, 2419-T851 plate, Ti-6Al-2Zr-2Sn-2Mo-2Cr duplex-annealed forging, Ti-6Al-2Cb- 1 Ta-1 Mo annealed plate, Ti-6Al-4V beta-annealed plate, Ti-6Al-4V annealed castings, Ti-6Al-4V isothermal forgings, Incoloy 903 heat-treated sheet, and 201.0 T7 castings. The properties investigated include tension, compression, shear, bend, impact, fracture toughness, fatigue, creep and stress-rupture, and stress corrosion at selected temperatures. GRA

N76-22368# Ballistic Research Labs., Aberdeen Proving Ground, Md.

DEFORMATION SUBSTRUCTURE OF COPPER SINGLE CRYSTALS AFTER EXPLOSIVE LOADING AS DISCLOSED BY ELECTRON-OPTICAL AND X-RAY METHODS

V. A. Greenhut, P. W. Kingman, S. Weissman, and M. Chen Oct. 1975 31 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A018136; BRL-1837) Avail: NTIS CSCL 11/6

Compressively shock-loaded copper single crystals were examined employing complementary methods of X-ray diffraction, X-ray topography (XRT), transmission electron microscopy (TEM) and scanning electron microscopy (SEM). The defect structures induced depended on the crystal orientation relative to the direction of shock propagation and also upon the existence or absence of a reflected tensile wave. TEM disclosed that the defect structure induced by compressive shock loading consisted of clusters of microtwins alternating with a tangled dislocation substructure. Failure zones did not occur. The induced defect structure exhibited a low net macroscopic misorientation which amounted to less than two degrees of arc and the misorientation of the twinned regions with respect to the adjacent dislocation substructure was less than 1/2 degree of arc. By contrast specimens subjected to a reflected tensile pulse exhibited a failure zone and the defect structure in its vicinity showed a substantial macroscopic misorientation. In addition, a high incidence of porosity was observed by SEM. The pores had octahedral shape with facets corresponding to close-packed planes. Structural details observed within the pores were identified as twinned regions.
Author (GRA)

N76-22369# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

A COMPUTER-AIDED, EXTERNAL STANDARD TECHNIQUE FOR SPECTROGRAPHIC ANALYSIS OF STAINLESS STEEL Final Report

F. L. Harris Apr. 1975 22 p refs
(DA Proj. 1J1-62105-A-328)
(AD-A017745; USAMERDC-2140) Avail: NTIS CSCL 11/6

A method is described which employs an external standard technique in the spectrographic analysis of stainless steels. This technique overcomes problems presented by the internal standard dilution effect always encountered in the spectrographic analysis of alloys of this type. The data were processed on the MERDC INTERCOM time-sharing computer system using existing programs which were slightly modified to suit the needs of this project.
GRA

N76-22370# Army Materials and Mechanics Research Center, Watertown, Mass.

ARMY UTILIZATION MANAGEMENT OF METALLIC MATERIALS Final Report

Kenneth H. Abbott Oct. 1975 86 p refs
(AD-A017792; AMMRC-MS-75-8) Avail: NTIS CSCL 11/6

Twenty metallic materials are reviewed in terms of: (1) geologic abundance in context with their current use and anticipated demand; (2) possible substitutes for those which may be in short supply; (3) those abundant materials which are currently underutilized; (4) conservation of these materials within the DoD; and (5) the potential for improved recycling. Recommendations are made to improve materials conservation and management technology. Author (GRA)

N76-22371# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE CORROSION OF ST-4 STEEL IN THE NATURAL ATMOSPHERE AND THE CORRELATION OF THE RESULTS WITH THE RESEARCH IN THE AEROSOL CHAMBER

K. Szawlowska-Wallisch and Z. Zurek 17 Apr. 1975 13 p refs Transl. into ENGLISH from Czas. Tech. (Poland), v. 76, no. 8, 1972 p 47-49
(AD-A017802; FTD-HC-23-1102-75) Avail: NTIS CSCL 11/6

The rate of corrosion of ST-4 steel is investigated in various

natural atmospheres: urban-industrial; laboratory; and room temperature. Correlation coefficients are calculated and results are compared with accelerated corrosion in an aerosol chamber with NaCl vapors and H2O vapors at room temperature. The effects of meteorological conditions such as temperature, humidity, precipitation, wind direction and velocity, atmospheric pollution, and the presence of chemicals vapors in the atmosphere (laboratory) are discussed. J.M.S.

N76-22372# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
INFLUENCE OF IRON AND SILICON CONTENT ON THE TENSILE PROPERTIES OF 7X75 AND ZR-MODIFIED 7X75 ALUMINUM PLATE Report for Jun. 1974 - Jun. 1975
Peter J. Blau Oct. 1975 36 p refs
(AF Proj. 7351)
(AD-A018059; AFML-TR-75-140) Avail: NTIS CSCL 11/6

This report studied how tensile strength and ductility of 7475-type aluminum plates were affected by Fe and Si content (purity), minor Zr substitutions for Cr, and thermomechanical processing (TMP) versus T651 tempers. In all, twenty combinations of composition and temper were examined. Smooth tensile specimens with 1/4 and 1/2 inch diameters were used. As Fe and Si content decreased, elongation and reduction of area increased in all but the T651 Zr-containing alloys. Purity had little effect on ultimate tensile and yield strength. The Zr-containing alloys were generally stronger than the Cr-containing alloys and had comparable ductility. Compared to the T651 temper, TMP had lower strength and higher ductility. TMP also increased the alloy's sensitivity to the Fe and Si content. Author (GRA)

N76-22373# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
PREVENTING THE FORMATION OF COPPER ALLOYS OF TIN, ANTIMONY, AND ARSENIC ON STEEL SURFACES DURING REHEATING TO REDUCE HOT SHORTNESS Report of Investigations 1975
Mark I. Copeland and John S. Howe 1975 30 p refs
(PB-247158/9; BM-RI-8080) Avail: NTIS HC $4.00 CSCL 11F

The Bureau of Mines discovered that silicon and nickel additions can prevent the formation of copper alloys of Sn, Sb, and As on the surface of steel during reheating to hot-working temperatures. When molten, these copper alloys cause surface hot shortness during hot working. Wrought steels were reheated isothermally and by simulated industrial practice; the resulting surfaces were metallographically evaluated. Theories for the beneficial effect of silicon and nickel additions are presented. GRA

N76-22374# Bureau of Mines, Reno, Nev. Metallurgy Research Center.
NITRIDE INTERMEDIATES IN THE PREPARATION OF COLUMBIUM, VANADIUM, AND TANTALUM METALS. 1. NITRIDE PREPARATION Research report, 1975
R. A. Guidotti, G. B. Atkinson, and D. G. Kesterke Oct. 1975 31 p refs
(PB-248108/3; BM-RI-8079) Avail: NTIS HC $4.00 CSCL 11F

The reaction of oxides of niobium vanadium, and tantalum with ammonia was studied in vertical, gas-solids reactors at temperatures ranging from 300 to 1,300C with the goal of preparing nitride intermediates for subsequent preparation of the metals by a thermal-decomposition step. The conditions necessary for conversion of the oxides to the nitrides were optimized. These included reactor material, temperature, composition, and space velocity of the nitriding gases, and particle size and thermal treatment of the oxides. The best nitride conversions were obtained in nonmetal reactors of Al2O3 or Vycor. Under fully optimized conditions, products containing less than one percent oxygen were readily obtained in under 6 hours. GRA

N76-23098* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MONOTECTIC AND SYNTECTIC ALLOYS EXPERIMENT MA-044
C. Y. Ang and L. L. Lacy *In its* Apollo-Soyuz Test Project Feb. 1976 25 p refs (For availability see N76-23074 13-88)
CSCL 11F

N76-23103* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTIPLE MATERIAL MELTING EXPERIMENT MA-150
R. S. Snyder and A. Boese *In its* Apollo-Soyuz Test Project Feb. 1976 4 p ref (For availability see N76-23074 13-88)
CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N76-22375 Cornell Univ., New York.
MODELS FOR THERMAL AND VIBRATIONAL PROPERTIES OF GLASSES AT LOW TEMPERATURES Ph.D. Thesis
Ming-Shih Lu 1975 105 p
Avail: Univ. Microfilms Order No. 76-8147

The thermal and acoustical anomalies in glasses at low temperatures were studied. The attenuation of the long-wavelength elastic waves is studied in a glasslike harmonic chain. The structural disorder gives rise to a phase incoherence of an initial planewave disturbance. The low-frequency limit of the density-of-states is calculated. It is related to the sound speed exactly as in the ordered case. A dislocation model which can partially explain these anomalies was then proposed, and further small angle X-ray scattering properties were suggested for these materials which can be tested experimentally. Major experimental results are critically reviewed, including some very recent ones. The two-level tunneling model is also reviewed and the statistical properties of the model are discussed by introducing a joint probability density for the two important parameters in the model. Dissert. Abstr.

N76-22376* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SILICA REUSABLE SURFACE INSULATION Patent
Howard E. Goldstein, Marnell Smith, and Daniel Leiser, inventors (to NASA) Issued 20 Apr. 1976 5 p Filed 26 Dec. 1973 Supersedes N74-14230 (12 - 05, p 0552)
(NASA-Case-ARC-10721-1; US-Patent-3,952,083; US-Patent-Appl-SN-427775; US-Patent-Class-264-63; US-Patent-Class-264-60; US-Patent-Class-264-66) Avail: US Patent Office CSCL 11D

A reusable silica surface insulation material is provided by bonding amorphous silica fibers with colloidal silica at an elevated temperature. The surface insulation is ordinarily manufactured in the form of blocks (i.e., tiles).
Official Gazette of the U.S. Patent Office

N76-22377* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TWO-COMPONENT CERAMIC COATING FOR SILICA INSULATION Patent
Alexander Pechman (LMSC, Sunnyvale, Calif.) and Robert M. Beasley, inventors (to NASA) (LMSC, Sunnyvale, Calif.) Issued 27 Apr. 1976 6 p Filed 24 Jun. 1974 Supersedes N74-30005 (12 - 19, p 2314) Sponsored by NASA
(NASA-Case-MSC-14270-1; US-Patent-3,953,646; US-Patent-Appl-SN-482104; US-Patent-Class-428-332; US-Patent-Class-106-54; US-Patent-Class-427-376; US-Patent-Class-427-379; US-Patent-Class-427-380; US-Patent-Class-427-402; US-Patent-Class-428-428; US-Patent-Class-428-450; US-Patent-Class-428-538; US-Patent-Class-428-920) Avail: US Patent Office CSCL 11B

Low density, fibrous, rigid, silica insulations are rendered impervious to moisture by application of a ceramic glaze coating comprising a silica barrier layer and an emissivity glaze layer comprising a high silica glass component, an emissivity agent and a borosilicate glass component. The resulting ceramic glaze laminate adhered to the fibrous silica insulation provides a moisture-impervious insulating material which exhibits a high emissivity and is resistant to delamination and spalling at repeated cycles of thermal shock.
Official Gazette of the U.S. Patent Office

N76-22378*# Kanner (Leo) Associates, Redwood City, Calif.
ACOUSTIC PHONONS IN POLYMER CRYSTALS
H. Baur Washington NASA Apr. 1976 38 p refs Transl. into ENGLISH from Kolloid-z. Z. Polym. (West Germany), v. 250, 1972 p 1,000-1,015
(Contract NASw-2790)
(NASA-TT-F-16994) Avail: NTIS HC $4.00 CSCL 11G

Simple models are developed to compare the behavior of acoustic phonons in the case of atomic substances and those of low molecular weight with high polymer ideal crystals. In the case of polymers the lattice force affects the valence angles in one direction and the anistropic lattice forces result in very low velocities at high wave length, regardless of direction of propagation. A portion of the dispersion relationship of the acoustic phonons show a convex curvature towards the abscissa close to the origin. The effects on mean square amplitudes of the latice elements and the thermal conductivity is analyzed. Author

N76-22379*# Singer Co., Little Falls, N.J.
DETERMINATION OF MECHANICAL PROPERTIES OF POLYMER FILM MATERIALS Final Report
Edward J. Hughes and John L. Rutherford Apr. 1975 109 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953959)
(NASA-CR-147115; KD-75-9) Avail: NTIS HC $5.50 CSCL 11D

Five polymeric film materials, Tedlar, Teflon, Kapton H, Kapton F, and a fiberglass reinforced polyimide, PG-402, in thickness ranging from 0.002 to 0.005 inch, were tested over a temperature range of -195 to 200 C in the 'machine' and transverse direction to determine: elastic modulus, Poisson's ratio, three percent offset yield stress, fracture stress, and strain to fracture. The elastic modulus, yield stress and fracture stress decreased with increasing temperature for all the materials while the fracture strain increased. Teflon and Tedlar had the greatest temperature dependence and PG-402 the least. At 200 C the Poisson ratio values ranged from 0.39 to 0.5; they diminished as the temperature decreased covering a range of 0.26 to 0.42 at -195 C. Shortening the gauge length from eight inches to one inch increased the strain to fracture and lowered the elastic modulus values. Author

N76-22380*# Battelle Columbus Labs., Ohio.
STUDIES OF ENCAPSULANT MATERIALS FOR TERRESTRIAL PHOTOVOLTAIC ARRAYS Quarterly Progress Report, 10 Dec. 1975 - 15 Mar. 1976
26 Mar. 1976 58 p refs Prepared for JPL Sponsored by ERDA
(Contracts NAS7-100; JPL-954328)
(NASA-CR-147163; ERDA/JPL-954328-76/1; QPR-2) Avail: NTIS HC $4.50 CSCL 11D

Progress is reported in studies related to the development of the low cost silicon solar array (LSSA). Major areas considered include: evaluation of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays; definition on encapsulant service environments and test conditions; and the development of accelerated and abbreviated testing methods for predicting performance of encapsulant materials over a 20-year lifetime. Results are discussed. J.M.S.

N76-22381*# Dow Corning Corp., Midland, Mich.
SILICON MATERIALS TASK OF THE LOW COST SOLAR ARRAY PROJECT, PART 2 Quarterly Report, 1 Oct. - 31 Dec. 1975
R. H. Hopkins, J. R. Davis, P. Rai-Choudhury, P. D. Blais, and J. R. McCormick 20 Feb. 1976 87 p refs Prepared for JPL
(Contracts NAS7-100; JPL-954331)
(NASA-CR-147162; RR-76-9C4-SIMAT-R1-Pt-2; QR-1-Pt-2) Avail: NTIS HC $5.00 CSCL 11D

Purity requirements for solar cell grade silicon material was developed and defined by evaluating the effects of specific impurities and impurity levels on the performance of silicon solar cells. Also, data was generated forming the basis for cost-tradeoff analyses of silicon solar cell material. Growth, evaluation, solar cell fabrication and testing was completed for the baseline boron-doped Czochralski material. Measurements indicate Cn and Mn seriously degrade cell performance, while neither Ni nor Cu produce any serious reduction in cell efficiency. Author

N76-22382*# Texas Instruments, Inc., Dallas.
SILICON MATERIAL TASK, PART 3: LOW-COST SILICON SOLAR ARRAY PROJECT
R. A. Roques and D. M. Coldwell Mar. 1976 21 p Prepared for JPL Sponsored by ERDA
(Contracts NAS7-100; JPL-954412)
(NASA-CR-147164; QR-1; TI-03-76-14-Pt-3; ERDA/JPL-954412-76/1-Pt-3) Avail: NTIS HC $3.50 CSCL 11D

The feasibility of a process for producing solar-grade polycrystalline silicon at a cost of less than $10 per kilogram was investigated. The approach taken was the direct reduction of high-purity silica with high-purity carbon using a plasma reactor. Principally investigated was the development of program evaluation criteria and initial work on the chemical reaction study. Experiments were conducted to optimize a procedure for preparation of the raw materials, silica and carbon, in order to achieve maximum homogeneity of mixing with a minimum of contamination. A computer program for the thermodynamic analysis of the Si-O-C system was begun. Tests were conducted using a dc hand-operated plasma torch. Results of these preliminary tests are inconclusive. Author

N76-22383*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POLYIMIDE FILM WEAR: EFFECT OF TEMPERATURE AND ATMOSPHERE
Robert L. Fusaro Washington Apr. 1976 22 p refs
(NASA-TN-D-8231; E-8487) Avail: NTIS HC $3.50 CSCL 11G

Friction and wear experiments conducted on polyimide films bonded to 440C stainless steel disks indicated that a wear transition (from high wear to low wear) accompanied a friction transition (from high friction to low friction). In dry argon or dry air (less than 20 ppm H2O), the transition was found to occur at 40 plus or minus 10 C; when H2O was present in air (10,000 ppm H2O), the transition was found to be elevated to a temperature between 100 and 200 C. Wear rate calculations made at 25, 100, and 200 C indicated that film wear was relatively constant for particular experimental conditions; however, the rate was strongly dependent on temperature and atmosphere. Author

N76-22384*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION OF IRON LUBRICATED WITH ALIPHATIC AND AROMATIC HYDROCARBONS AND HALOGENATED ANALOGS
Donald H. Buckley Washington Apr. 1976 18 p refs
(NASA-TN-D-8208; E-8558) Avail: NTIS HC $3.50 CSCL 11G

The influence of oxygen and various organic molecules on the reduction of the friction of an iron (011) single crystal surface was investigated. A comparison was made between aliphatic and aromatic structures, all of which contained six carbon atoms, and among various halogen atoms. Results of the investigation indicate that hexane and benzene give similar friction coefficients over a range of loads except at very light loads. At light loads, the friction decreased with an increase in the load where the halogens fluorine and chlorine are incorporated into the benzene molecular structure; however, over the same load range when bromine and iodine were present, the friction was relatively unchanged. The aliphatic compound chlorohexane exhibited lower friction coefficients than the aromatic structure chlorobenzene at very light loads. With the brominated benzene structures, however, friction was essentially the same. Oxygen was more effective in reducing friction than were the simple hydrocarbons. Author

N76-22385# California Univ., Los Angeles. Dept. of Materials
AN EXPERIMENTAL STUDY ON THE COMPRESSIVE BIAXIAL STRENGTH OF CERAMICS Final Report, 10 Oct. 1970 - 31 Jul. 1973
Marc Adams and George Sines Aug. 1975 306 p refs
(Contracts N00019-73-C-0294; N00019-72-C-0159)
(AD-A016615; UCLA-ENG-7537) Avail: NTIS CSCL 11/2

A mechanical testing program in which the biaxial compressive

strength of WESGO AL-995, high strength alumina was measured has shown that the biaxial compressive strength of such material is only slightly affected by the value of the intermediate principal compressive stress. The average value of the compressive strengths measured in all stress states, excluding the equi-biaxial compression stress state, was 528 ksi. The standard deviation of the individual measured strengths was only a few percent of the average values, which is consistent with the predictions of flaw statistics theories. The tensile strengths measured for the material indicate the ratio of compressive strength to tensile strength is approximately 18. It is suggested that the compressive strength of a material is limited by the amount of crack damage which may be sustained in the material without structural collapse occurring. The general aspects of compressive failure are presented which include a description of the micromechanical mechanisms of crack initiation and extension that can operate in a body subjected to purely compressive loading. Three types of flaws are identified which can initiate cracks. The problem of describing crack initiation and extension in three dimensions is addressed. The results of experimental studies of crack extension from three-dimensional, penny-shaped flaws introduced into blocks of polymethylmethacrylate plastic are presented. GRA

N76-22386# Atomic Energy Board, Pretoria (South Africa).
PREPARATION AND PROPERTIES OF ASBESTOS-CEMENT AND CEILITE POLYMER COMPOSITES
A. Jurriaanse, R. A. Basson, and G. S. DuToit Jun. 1975 12 p refs
(PEL-245) Avail: ERDA Depository Libraries HC $4.00

Polymer composites based on asbestos cement products were prepared by impregnation of the asbestos cement products with suitable liquid monomers, followed by in situ polymerization of the monomers by exposure of the products to gamma-radiation. Evaluation of the physical properties of the composites showed that remarkable improvements could be obtained with polymer loads between 5 and 40%. Compared with control samples, both water uptake and moisture movement in composite samples could be reduced by a factor of 10 to 30, while flexural strength could be increased by a factor of 2 to 5. Author (NSA)

N76-22387# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Angewandte Gasdynamik.
EXPERIMENTAL INVESTIGATION OF THE BEHAVIOR OF ABLATING BODIES WITH VARYING NOSE SHAPE AND MATERIAL COMPOSITION
Knud Kindler 15 Jan. 1976 59 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-08) Avail: NTIS HC $4.50; DFVLR, Cologne DM 23.70

Research of polytetrafluoroethylene ablation is described which was done in arc heated air flow. The purpose of the experiments is to show the influence of the energy content of the flow, of the probe shape, and of addition of different anorganic materials on the ablation process. Blunted cones, hemisphere - and flat nosed cylinders made of PTFE and PTFE with addition of 25 % glass, ceramic, and graphite respectively are investigated. The total enthalpies are in the range of 8 - 15 MJ/kg. The development of the internal temperature and the loss of material during ablation are indicated. Author (ESA)

N76-22388# Washington Univ., Seattle. Dept. of Mining Metallurgical and Ceramic Engineering.
FIBER STRENGTH Quarterly Progress Report, 1 Nov. 1974 - 1 Feb. 1975
William D. Scott and G. Achutaramayya 10 Mar. 1975 10 p ref
(Contract N00123-73-C-1200)
(AD-A017720) Avail: NTIS CSCL 11/5

High strength optical fibers communication system construction. This report summarizes an effort to increase fiber strength by coating (sizing) with polymers which reduce surface damage. The polyethylene coating investigated increased the strength of fused silica fibers from 143 MN/sq to 3440 MN/sq for short gage lengths. Author (GRA)

N76-22389# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERMET FRICTION MATERIAL
B. G. Arabei, I. I. Zverev, M. S. Zukher, S. S. Kokonin, and Yu. M. Markov 13 Nov. 1975 10 p Transl. into ENGLISH from a Russian Patent no. 393344, 10 Aug. 1975 p 1-2
(AD-A018168; FTD-ID(RS)I-2316-75) Avail: NTIS CSCL 11/7

The invention is related to the field of cermet friction materials which are used for braking gear, for example, aircraft brakes. The purpose of the invention is to raise the thermal, tensile and flexural strength. This is achieved by introducing graphite fiber into the proposed cermet friction material containing boron carbide, boron nitride, iron group metals and zirconium carbide. GRA

N76-22390# General Electric Co., Schenectady, N.Y. Corporate Research and Development.
CERAMIC SINTERING Final Technical Report, 1 Apr. 1974 - 30 Jun. 1975
Charles D. Greskovich, Joseph H. Rosolowski, and Svante Prochazka Jul. 1975 102 p refs
(Contract N00014-74-C-0331; ARPA Order 2698)
(AD-A014480; SRD-75-084) Avail: NTIS CSCL 11/2

Measurement of the rate of oxidation and creep rate in air of chemically vapor deposited Si3N4 at around 1500C are reported. Attempts to prepare pure, dense Si3N4 bodies by hot pressing powder at ultra-high pressures were partially successful. Resistance heaters made of dense, sintered SiC were tested and found to have in-use lifetimes at least 10 times longer than those of commercially available heaters tested in the same way. It was found that the resistivity of B containing dense, sintered beta-SiC could be changed through compensation of the B acceptors by N donors introduced from the sintering furnace atmosphere during firing. The thermal EMF of a junction made of p- and n-types of dense sintered beta-SiC was measured over the temperature range from 100C to 1,500C and found to be 0.95 volt at 1,500C. A way was found to densify B4C without hot pressing. Bodies of B4C having about 94% of theoretical density were made by using conventional sintering processes and doping the powder with either SiC or B4C. Extensive work presented herein on the sintering of covalently bonded solids (beta-SiC, Si, alpha-Si3N4, AlN). GRA

N76-22391# North Carolina State Univ., Raleigh. Engineering Research Services Div.
OPTIMAL DENSIFICATION OF CERAMICS BY RATE CONTROLLED SINTERING Final Report, Feb. 1974 - Jun. 1975
H. Palmour, III and T. M. Hare Jul. 1975 80 p refs
(Contract N00019-74-C-0265)
(AD-A018163) Avail: NTIS CSCL 11/2

The rate controlled sintering characteristics of (a) 99.9% Al2O3, (b) 99.9% MgAl2O4 and (c) a BaTiO3-CaZrO3 composition have been studied in comparison with conventional isothermal treatments. Process steps which precede firing of about 99.9% Al2O3 ceramics were shown to exert an important influence upon final microstructures; improvements attributed to preprocess optimization were found to be effective with both conventional and rate controlled sintering regimes. Through successive step-by-step optimizations, a novel dry process sequence has been evolved which incorporates (a) dry milling (b) introduction of fugitive organic binder and lubricant phases, (c) remilling, (d) granulation, (e) preforming by dry pressing, (f) isostatic re-pressing and (g) controlled binder burnout. These optimizations of particulate processing and of density-time profiles have been undertaken primarily in the engineering sense: it has been demonstrated that they provide practical means for establishing rational engineering control of densification dynamics. GRA

N76-22392# Budd Co., Fort Washington, Pa. Technical Center.
FEASIBILITY STUDY OF PLASTIC AUTOMOTIVE STRUCTURE Final Report, Jun. 1974 - Aug. 1975
Herbert A. Jahnle Dec. 1975 215 p refs
(Contract DOT-HS-4-00929)
(PB-248354/3; TCR-0283-F; DOT-HS-801771) Avail: NTIS HC $7.75 CSCL 13F

Contents: state of the art survey (Materials, reinforcing materials, material properties, manufacturing processes, static analysis of plastic structure, automotive crashworthiness);

integration of plastics in automotive structure; frontal structure design, fabrication and testing; recyclability or disposal of plastics; flammability; repairability; energy considerations; and plastics cost and availability. GRA

N76-22393# Dow Chemical Co., Midland, Mich.
NONMETALLICS: THEIR PERFORMANCE IN THE DESALINATION ENVIRONMENT
J. A. Manning, Jr. and S. V. Carleton Apr. 1975 202 p refs
(Contract DI-14-30-3111)
(PB-248709/8; W76-03191; OWRT/S-76/6) Avail: NTIS HC $7.75 CSCL 11C

Of seventy-three paint and coating systems tested in treated sea water, sixty were considered satisfactory for desalination plant service at 110F; only eighteen systems were rated as adequate at 250 F. Baked phenolic or fluidized bed-polyphenylene sulfide types should be considered for high temperature operations. Nineteen fiber reinforced plastic (FRP) laminate systems, thirteen thermoplastic types and fifteen commercial FRP piping systems were evaluated at regular intervals over a total exposure period of fifteen months. Polysulfone was an outstanding thermoplastic in 250 F sea water. Prekrete (trade name) G-8 was the only corrosion resistant cement found suitable for use in 250 F sea water. GRA

N76-22394# Bishop Coll., Dallas, Tex. Div. of Science and Mathematics.
REACTION KINETICS OF THE RADIATION-INDUCED GRAFTING OF STYRENE ON POLYETHALENE FILM
Joseph E. Wilson Oct. 1975 26 p refs
(Contract N00014-72-C-0052; NR Proj. 356-520)
(AD-A018335; TR-6) Avail: NTIS CSCL 07/5

Based on rate data obtained previously, an analysis has been made of the reaction kinetics of the radiation-induced grafting of styrene on polyethylene film using various concentrations of methanol in the styrene. A new feature of the work involves the use of internal film concentrations of styrene and methanol computed from the Flory theory of polymer/solvent interaction, which possibly improves the accuracy of termination rate constant (kt) calculations at various methanol concentrations. A graphical plot of kt dependence on internal: film viscosity is computed from an equation of Smoluchowski. Techniques are defined which may lead to improved accuracy in the computation of rate constants. GRA

N76-22395# Princeton Univ., N.J. Dept. of Chemical Engineering.
THE FORMATION OF NETWORK POLYMERS Technical Report, Jul. - Nov. 1975
John K. Gillham Nov. 1975 16 p refs
(Contract N00014-76-C-0200)
(AD-A018338; TR-1) Avail: NTIS CSCL 07/4

It is demonstrated that the thermosetting process is characterized by two transition temperatures, T(gg) and T(g infinity). Implications of this finding are discussed for crosslinking systems in general. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N76-22396*# Rockwell International Corp., Canoga Park, Calif.
HIGH PERFORMANCE N2O4/AMINE ELEMENTS Final Report
A. Y. Falk Mar. 1976 98 p refs
(Contract NAS9-14126)
(NASA-CR-147555; R-9847-1) Avail: NTIS HC $5.00 CSCL 21I

An analytical and experimental investigation was conducted to develop an understanding of the mechanisms that cause reactive stream separation, commonly called blowapart, for hypergolic propellants. The investigation was limited to a N2O4/MMH propellant combination and to a range of engine-operating conditions applicable to the space tug and space shuttle attitude control and orbital maneuvering engines. Primary test variables were: chamber pressure (1 to 20 atm), fuel injection temperature (283 to 400 K)m and propellant injection velocity (9 to 50 m/s). The injector configuration studied was the unlike doublet. The reactive stream separation experiments were conducted using special combustors designed to permit photography of the near-injector spray combustion flow field. Analysis of color motion pictures provided the means of determining the occurrence of reactive stream separation. Author

N76-22397*# Naval Surface Weapons Center, White Oak, Md.
THE DEVELOPMENT OF SPACECRAFT EXPLOSIVES FOR THE LYNDON B. JOHNSON SPACE CENTER Final Report, 1 Jul. 1974 - 31 Dec. 1975
31 Dec. 1975 57 p refs
(NASA Order T-8917-E)
(NASA-CR-147547; NSWC-841/NASA) Avail: NTIS HC $4.50 CSCL 19A

Several heat resistant secondary explosives suitable for use in spacecraft hardware were characterized and tested in order to select a prime candidate for further study. The design goal criterion was that no significant degradation of the explosive takes place after exposure to 315 C. The final selection was made from the following candidates: PYX (2,6-bis (picrylamino)-3, 5-dinitropyridine), ONT (octanitro-m-terphenyl), and TPT (2,4,6 tripicryl-s-triazine), following performance tests in detonating cords. TPT was the final selection and was further characterized and evaluated in order to obtain data for a procurement specification. Author

N76-22398*# General Electric Co., Evendale, Ohio.
EXPERIMENTAL CLEAN COMBUSTOR PROGRAM, ALTERNATE FUELS ADDENDUM, PHASE 2 Final Report
C. C. Gleason and D. W. Bahr Jan. 1976 67 p refs
(Contract NAS3-18551)
(NASA-CR-134972; R76AEG268) Avail: NTIS HC $4.50 CSCL 21D

The characteristics of current and advanced low-emissions combustors when operated with special test fuels simulating broader range combustion properties of petroleum or coal derived fuels were studied. Five fuels were evaluated; conventional JP-5, conventional No. 2 Diesel, two different blends of Jet A and commercial aromatic mixtures - zylene bottoms and haphthalene charge stock, and a fuel derived from shale oil crude which was refined to Jet A specifications. Three CF6-50 engine size combustor types were evaluated; the standard production combustor, a radial/axial staged combustor, and a double annular combustor. Performance and pollutant emissons characteristics at idle and simulated takeoff conditions were evaluated in a full annular combustor rig. Altitude relight characteristics were evaluated in a 60 degree sector combustor rig. Carboning and flashback characteristics at simulated takeoff conditions were evaluated in a 12 degree sector combustor rig. For the five fuels tested, effects were moderate, but well defined. Author

N76-22399*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ATOMIC HYDROGEN STORAGE METHOD AND APPARATUS Patent Application
John A. Woolam, inventor (to NASA) Filed 13 Apr. 1976 10 p
(NASA-Case-LEW-12081-1; US-Patent-Appl-SN-676432) Avail: NTIS HC $3.50 CSCL 21I

Atomic hydrogen, for use as a fuel or as an explosive, is stored in the presence of a strong magnetic field in exfoliated layered compounds such as molybdenum disulfide or an elemental layer material such as graphite. The compound is maintained at liquid helium temperatures and the atomic hydrogen is collected on the surfaces of the layered compound which are exposed during delamination (exfoliation). The strong magnetic field and the low temperature combine to prevent the atoms of hydrogen from recombining to form molecules. NASA

N76-22400*# Utah Univ., Salt Lake City. Dept. of Civil Engineering.
MEASURED PROPERTIES OF PROPELLANT FOR SOLID

ROCKET BOOSTER OF ONE-EIGHT SCALE DYNAMIC SHUTTLE MODEL Final Report
William L. Hufferd Nov. 1975 67 p refs
(Grant NsG-1113)
(NASA-CR-147208; UTEC-CE-75-178) Avail: NTIS HC $4.50 CSCL 21I

Static and dynamic material property tests were conducted on inert UTI-610 propellant to obtain basic mechanical response data for use in analysis of the one-eight scale models of the space shuttle SRB now being dynamically tested. Author

N76-22401*# Rocketdyne, Canoga Park, Calif.
HIGH PERFORMANCE N2O4/AMINE ELEMENTS Final Summary Report
A. Y. Falk Mar. 1976 53 p refs
(Contract NAS9-14126)
(NASA-CR-147572; R-9847-2) Avail: NTIS HC $4.50 CSCL 21I

An analytical and experimental investigation was conducted to develop an understanding of the mechanisms that cause reactive stream separation, commonly called blowapart, for hypergolic propellants. The investigation was limited to the N2O4/MMH propellant combination and to a range of engine-operating conditions applicable to the space tug and space shuttle attitude control and orbital maneuvering engines. Primary test variables were: chamber pressure (1 to 20 atm), fuel injection temperature (283 to 400 K)m and propellant injection velocity (9 to 50 m/s). The injector configuration studied was the unlike doublet. The reactive stream separation experiments were conducted using special combustors designed to permit photography of the near-injector spray combustion flow field. Analysis of color motion pictures provided the means of determining the occurrence of reactive stream separation. Author

N76-22402# European Space Agency, Paris (France).
FACILITIES FOR STUDYING THE COMBUSTION OF METALLIZED SOLID PROPELLANTS IN ROTATION
Bernard Doin et al Jan. 1976 77 p refs Transl. into ENGLISH of 'Moyens d'Etude Exptl. de la Combustion d'un Propergol Solide Metallise en Rotation', ONERA, Paris Report ONERA-NT-229, 1974
(ESA-TT-236; ONERA-NT-229) Avail: NTIS HC $5.00

The capacity is described of the equipment developed for studying experimentally, from microscopic to full engine size, the influence of rotation on the combustion of metallized solid propellants. Small scale tests on samples permit the determination of a critical value for the diameter of aluminum droplets, below which the combustion kinetics of the metal remain unchanged. Tests on disks permit quantitative characterization of the propellant sensitivity to acceleration. At full engine scale, the apparatus is equipped with various measuring devices for characterizing the functioning of a rocket engine rotating about its longitudinal axis. The equipment is also capable of contributing to the development of actual engines of relatively large dimensions and high performance. Author (ESA)

N76-22403# Exxon Research and Engineering Co., Linden, N.J. Government Research Lab.
EVALUATION OF METHODS TO PRODUCE AVIATION TURBINE FUELS FROM SYNTHETIC CRUDE OILS, PHASE 1 Final Report, 24 Jun. 1974 - 24 Jan. 1975
Henry Shaw, Charles D. Kalfadelis, and Charles E. Jahnig Mar. 1975 284 p refs
(Contract F33615-74-C-2036; AF Proj. 3048)
(AD-A016456; GRU-1PEA-75; AFAPL-TR-75-10) Avail: NTIS CSCL 07/1

The feasibility of producing aviation turbine fuels from domestic coal and shale derived oils was assessed. Based on petroleum refining technology, the best methods currently available from making fuel products were evaluated for use in producing jet fuels from synthetics. It was concluded that shale oil is most likely to be used in jet fuel manufacturing. Coal liquids, on the other hand, will probably be used to make components for jet fuels and possibly also for new high density jet fuels. As a result of this analysis, it was recommended that shale oil hydroprocessing be emphasized in the experimental phase (Phase II) for producing specification aviation turbine fuels, along with the recommendation that hydroprocessing of coal oil should be studied as a source of jet fuel components and possibly as a new high density jet fuel. GRA

N76-22404# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
AVIATION TURBINE FUEL LUBRICITY EVALUATION OF CORROSION INHIBITORS Final Report, Jun. 1973 - Mar. 1974
Joseph Petrarca, Jr. Sep. 1975 53 p refs
(AF Proj. 3048)
(AD-A017376; AFAPL-TR-75-47) Avail: NTIS CSCL 21/4

This report describes the evaluation of the effectiveness of corrosion inhibitors as fuel lubricity agents. The study was conducted with the Furey Ball-on-Cylinder. In the study, the eleven corrosion inhibitors from QPL-25017-9 were evaluated as lubricity agents in three base fluids, at various concentrations, and at the two base fluid temperatures of 75F and 150F. The rank effectiveness of the inhibitors correlated for the following two cases: (1) The inhibitors at their maximum allowable concentration in the three base fluids at 75F. (2) The inhibitors at three concentrations in the same base fluid at 75F. The rank effectiveness of the inhibitors did not correlate for the case where the corrosion inhibitors were at their maximum allowable concentrations in the same base fluid but at the two different temperatures of 75F and 150F. GRA

N76-22405# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
AUDIBLE AND ULTRASONIC ACOUSTIC EMISSIONS FROM COMPOSITE SOLID PROPELLANTS Interim Report, Feb. - Jun. 1975
James I. Craig, Warren C. Strahle, and John Palfery Jul. 1975 54 p refs
(Grant AF-AFOSR-2805-75; AF Proj. 9711)
(AD-A017583; AFOSR-75-1517TR) Avail: NTIS CSCL 21/9

An apparatus to test the audible and ultrasonic emissions from composite solid propellants was designed, constructed and checked out. Tests were conducted at 300 psia for eight aluminized HTPB-AP propellants. The tests were conducted under both nitrogen and air pressurization. For the audible emissions in the range 100 - 2,500 Hz there is a marked effect of the pressurization fluid. In air the noise output is 10,000 higher than in nitrogen. There is a definite possibility that the noise output is responsible for observed chamber pressure roughness level. For the ultrasonic signal in the range 50 to 300 kHz there are strong spectral peaks observed but their origin is not clear and they do not correlate with observed deflagration behavior. For audible signals a striking effect of AFCAM aluminum coating is the reduction of signal strength. GRA

N76-22406# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SOLID PROPELLANT BURNING RATE MEASUREMENT IN A CLOSED BOMB Final Report
Aivars Celmins Oct. 1975 53 p refs
(DA Proj. 1T1-61102-A-324; DA Proj. 1T1-61102-A-14B)
(AD-A018448; BRL-1840) Avail: NTIS CSCL 19/1

Experiments show that the burning rate of solid propellants is a function of the pressure under which the burning takes place. An often used method to determine that burning rate function is to burn a sample of the propellant in a closed container and to register the corresponding pressure-time data. With the aid of formulas from thermodynamic theory these observations can be manipulated to yield the desired parameters of the burning rate function. This analysis is typically done under a number of restrictive assumptions, e.g., the assumption of constant temperature in the container throughout the experiment. In spite of such assumptions the corresponding algorithms published are complicated and an error analysis of the results has apparently never been reported. In the present paper new formulas are derived under relaxed assumptions. With the aid of these formulas the data analysis is reduced to a curve fitting task. For such tasks standard theories and computer programs are available, which furnish the unknown parameters of the burning rate function together with estimates of their variances and covariances. The new formulas can be replaced by simpler ones under conditions, which are controllable by the design of the experiment. It is found that for such simplifications the tem-

perature's behavior is not relevant. In general the simplifications are permissible if the maximum pressure achieved during the experiment remains essentially smaller than the chemical energy released per unit volume of the propellant. The latter is typically of the order of 10 to 10th power Pa (10 to 5th power). An example illustrates the application of the new algorithm.
Author (GRA)

N76-22407# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FUELS AND LUBRICANTS FOR AIRCRAFT
M. E. Reznikov 27 Feb. 1975 342 p refs Transl. into ENGLISH from the book "Topliva i Smazochnye Materialy Dlya Letatelnykh Apparatov" Moscow, 1973 p 1-231
(AD-A018261; FTD-HC-23-2134-74) Avail: NTIS CSCL 21/4
Contents: General characteristis of aircraft fuels; Brief data on the production of fuels--Petroleum the basic raw material in fuel production; Fuels for air breathing jet engines; Aviation gasolines--Piston engines and fuel requirements; Rocket propellants; Lubricants and technical fluids; Production of synthetic oils and liquids; Oils for aircraft engines; Transmission oils; Greases. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N76-22408 Duke Univ., Durham, N.C.
THE EQUATION OF STATE OF HELIUM NEAR THE LIQUID-GAS CRITICAL POINT Ph.D. Thesis
Robert Paul Behringer 1975 171 p
Avail: Univ. Microfilms Order No. 76-8729
High precision pvt data on He3 and a mixture of 80.5 percent He3-19.5 percent He4 are presented. The pressure along isochores was measured by means of an in situ strain gauge capable of resolving 0.000001 Atm. Temperature changes of 5 times 10 to the minus 7th power K were detected and density determinations had a precision of 0.1 percent. The precision of these data was sufficient that (delta P / delta T) sub rho could be calculated to within a few tenths of a percent. For the He3 sample the measurements were made on 40 isochores over a density range (1 plus or minus 0.2) rho sub c and a temperature range (1 plus or minus 0.5) rho sub c in density and (1 plus or minus 0.1) T sub c in temperature. A brief discussion of the thermodynamics of multi-phase systems is presented.
Dissert. Abstr.

N76-22409# National Bureau of Standards, Washington, D.C.
DISTRIBUTION OF WATER THROUGH A VERTICAL PLANE FROM AUTOMATIC SPRINKLER HEADS Interim Report
Richard L. P. Custer Dec. 1975 48 p refs Sponsored in part by Dept. of Housing and Urban Develop.
(PB-248913/6; NBSIR-75-920) Avail: NTIS HC $4.00 CSCL 13L
An investigation was conducted to evaluate the distribution of water through a vertical plane from automatic sprinkler heads as a function of water discharge rate and sprinkler spacing. Tests were conducted to simulate discharging an automatic sprinkler head in a corridor to determine the effectiveness of the sprinkler head in covering a doorway with water spray when positioned at various locations. Major differences in distribution characteristics between sprinkler heads produced by different manufacturers were observed. It was determined that only sprinklers installed on the centerline of the doorway and discharging water at a flow rate of 20 gallons-per-minute or more would cover the top of the doorway. GRA

N76-22410# National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
DATA PROCESSING AND DATA ANALYSIS PROCEDURES FOR FIRE LOAD AND LIVE LOAD SURVEY PROGRAM Interim Report, Jun. 1973 - Dec. 1975
Robert McCabe, Charles Culver, Larry Lee (Wiggins (J. H.) Co., Redondo Beach, Calif.), and Joseph Hirschberg (Wiggins (J. H.) Co., Redondo Beach, Calif.) Jan. 1976 344 p refs Sponsored in part by Natl. Academy of Sci., Natl. Res. Council and Gen. Serv. Admin.
(Contract BRAB-27-73-53)
(PB-248699/1; NBSIR-76-982) Avail: NTIS HC $10.00 CSCL 13L
Data collection and data processing procedures utilized in connection with a nationwide fire load and live load survey program are described. The techniques developed for transferring the field survey data to a form suitable for computer processing are discussed. Procedures adopted for data analysis are included. Documentation of the computer programs developed for this purpose is also presented. GRA

N76-22411# National Bureau of Standards, Washington, D.C. Center for Fire Research.
FULL-SCALE CORRIDOR FIRE EXPERIMENT USING A GLASS FIBER CARPET Final Report
Leslie H. Breden Dec. 1975 33 p refs
(PB-248643/9; NBSIR-75-782) Avail: NTIS HC $4.00 CSCL 13L
A corridor fire experiment was carried out using a glass fiber carpet. It was observed that with a fuel loading of 2.7 pounds per square foot of wood in an adjacent fire room, no propagation of the fire occurred down the corridor. The glass fiber carpet in the burn-room became discolored and there was a significant weight loss of the carpet directly in contact with the fire. The carpet did not produce significant levels of smoke and did not spread the fire into the corridor. GRA

N76-22412# National Bureau of Standards, Washington, D.C. Center for Fire Research.
CALCULATIONS OF RADIANT HEAT FLUX IN THE PROPOSED FLOOR COVERING FLAME SPREAD TEST APPARATUS Final Report
James Quintiere and Kevin Bromberg Dec. 1975 21 p refs
(PB-248640/5; NBSIR-75-706) Avail: NTIS HC $3.50 CSCL 13L
Calculations were made to determine the radiant heat flux distribution to the test specimen in the proposed radiant panel flame spread test for floor covering materials. Comparison with measured heat flux indicates a significant heat transfer contribution from the enclosure of the test apparatus. Also, nonuniformities in the temperature of the radiant panel effect the resultant flux distribution. Based on these results, it is expected that two similar test apparatuses would not have identical heat flux profiles along the specimen. Additional calculations were made to illustrate possible heat flux profiles capable with the present apparatus under various panel temperatures and orientations. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N76-22413 Arizona Univ., Tucson.
SLOTS IN A PARALLEL PLATE WAVEGUIDE Ph.D. Thesis
Jeffrey Paul Quintenz 1975 150 p
Avail: Univ. Microfilms Order No. 76-8674
An integral equation is developed for the aperture electric field for the case of a single slot with sources in the guide. The integral equation is solved using the method of moments. The method used to solve the single slot case is then extended to treat two or more slots. Reflection, transmission, and coupling coefficients are obtained as well as total power coupled out of the guide and antenna patterns. Mutual coupling effects in an antenna array are discussed and the moment method solution is compared with simple array theory for multiple slots. The moment method is shown to fill a gap in previously presented results for medium slot widths. The reciprocal problem applicable to shielding is considered next by formulating an integral equation for the aperture electric field when the sources are exterior to the waveguide. Dissert. Abstr.

N76-22414 California Univ., Irvine.
DYNAMIC MOMENT ANALYSIS OF TRACKING SYSTEMS FOR SYMBOL SYNCHRONIZATION Ph.D. Thesis
Lewis Peterson 1975 101 p
Avail: Univ. Microfilms Order No. 76-7235

The time of occurrence of information source state transitions is essential for synchronization of information receiving equipment. Decoding of the many encoding schemes is not generally possible without symbol synchronization. Thus, the attainment of symbol synchronization is a fundamental limitation on the effectiveness of coded communication systems. The apparent rate of source state changes is influenced by Doppler effect, scattering of electromagnetic energy, and other channel environments. The synchronization system must track such changes. Thus, symbol synchronizers are tracking systems. A model for symbol synchronizers is developed. The early-gate/late-gate class of epoch error detection is shown to lead to a random gain control system driven by a random exitation. Dissert. Abstr.

N76-22415 Missouri Univ., Columbia.
EVALUATION AND ANALYSIS OF QUAD DIVERSITY TROPOSPHERIC COMMUNICATION LINKS FROM STRIP CHART DATA Ph.D. Thesis
Roderick Vivian James 1975 191 p
Avail: Univ. Microfilms Order No. 76-7508

Procedures employed to evaluate the performance of a quad diversity tropospheric communications system are discussed. The test data used is stored on six channel strip chart recordings. This analog strip chart data is first digitized and stored on magnetic tape using a solid state scanning device. The scanning system is under the control of a digital equipment Corporation PDP 11/20 minicomputer. Statistical procedures are developed to characterize the data obtained from the strip charts. These procedures are used to test the validity of the Rayleigh fading assumption in tropospheric communications for strip chart data. The various diversity combining techniques are discussed, and the effect of the received signals extracted from strip chart data on the combiner performance is investigated. Dissert. Abstr.

N76-22416 Syracuse Univ., N.Y.
DEMODULATION OF VERY WIDE BAND FM UTILIZING ZERO CROSSING INFORMATION Ph.D. Thesis
Richard Gordon Wiley 1975 95 p
Avail: Univ. Microfilms Order No. 76-7625

A new method for demodulation of very wideband frequency modulated signals using only the zero crossings is presented. The method is particularly useful when the bandwidth of the modulation is on the order of the carrier frequency and the frequency deviation is also on the order of the carrier frequency. The results show that an iterative recovery procedure can be used to demodulate FM signals and also to recover square integrable bandlimited signals from nonequally spaced sample values provided that mild restrictions are placed on the sampling sequence (or zero crossing sequence). A procedure for computing the coefficients of these terms for minimum mean square error is given. The method was simulated via computer and some examples are shown verifying the validity of the approach. An extension of the method to the reconstruction of bandlimited signals from unequally spaced samples is also presented. Dissert. Abstr.

N76-22417*# Cutler-Hammer, Inc., Deer Park, N.Y.
Ku BAND LOW NOISE PARAMETRIC AMPLIFIER Final Report
Mar. 1976 33 p
(Contract NAS9-14586)
(NASA-CR-147560; C362-1) Avail: NTIS HC $4.00 CSCL 17B

A low noise, K sub u-band, parametric amplifier (paramp) was developed. The unit is a spacecraft-qualifiable, prototype, parametric amplifier for eventual application in the shuttle orbiter. The amplifier was required to have a noise temperature of less than 150 K. A noise temperature of less than 120 K at a gain level of 17 db was achieved. A 3-db bandwidth in excess of 350 MHz was attained, while deviation from phase linearity of about + or - 1 degree over 50 MHz was achieved. The paramp operates within specification over an ambient temperature range of -5 C to +50 C. The performance requirements and the operation of the K sub u-band parametric amplifier system are described. The final test results are also given. Author

N76-22418*# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
RADAR DATA PROCESSING AND ANALYSIS Final Report, 15 May 1974 - 14 Mar. 1975
D. Ausherman, R. Larson, and C. Liskow Feb. 1976 54 p refs
(Contract NAS9-14123)
(NASA-CR-147565; ERIM-109600-45-F) Avail: NTIS HC $4.50 CSCL 17I

Digitized four-channel radar images corresponding to particular areas from the Phoenix and Huntington test sites were generated in conjunction with prior experiments performed to collect X- and L-band synthetic aperture radar imagery of these two areas. The methods for generating this imagery are documented. A secondary objective was the investigation of digital processing techniques for extraction of information from the multiband radar image data. Following the digitization, the remaining resources permitted a preliminary machine analysis to be performed on portions of the radar image data. The results, although necessarily limited, are reported. Author

N76-22419*# Ohio State Univ., Columbus. ElectroScience Lab.
VOLUMETRIC PATTERN ANALYSIS OF FUSELAGE-MOUNTED AIRBORNE ANTENNAS Ph.D. Thesis
Chong L. Yu Apr. 1976 200 p refs
(Grant NGL-36-008-138)
(NASA-CR-147099; TR-2902-24) Avail: NTIS HC $7.50 CSCL 17B

A volumetric pattern analysis of fuselage-mounted airborne antennas at high frequencies was investigated. The primary goal of the investigation was to develop a numerical solution for predicting radiation patterns of airborne antennas in an accurate and efficient manner. An analytical study of airborne antenna pattern problems is presented in which the antenna is mounted on the fuselage near the top or bottom. Since this is a study of general-type commercial aircraft, the aircraft was modeled in its most basic form. The fuselage was assumed to be an infinitely long perfectly conducting elliptic cylinder in its cross-section and a composite elliptic cylinder in its elevation profile. The wing, cockpit, stabilizers (horizontal and vertical) and landing gear are modeled by 'N' sided bent or flat plates which can be arbitrarily attached to the fuselage. The volumetric solution developed utilizes two elliptic cylinders, namely, the roll plane and elevation plane models to approximate the principal surface profile (longitudinal and transverse) at the antenna location. With the belt concept and the aid of appropriate coordinate system transformations the solution can be used to predict the volumetric patterns of airborne antennas in an accurate and efficient manner. Applications of this solution to various airborne antenna problems show good agreement with scale model measurements. Extensive data are presented for a microwave landing antenna system. Author

N76-22420*# Hughes Aircraft Co., Culver City, Calif. Space and Communications Group.
SPACE SHUTTLE Ku-BAND INTEGRATED RENDEZVOUS RADAR/COMMUNICATIONS SYSTEM STUDY Final Report
Mar. 1976 224 p refs
(Contract NAS9-14595)
(NASA-CR-147583; D4148; SCG-60041R) Avail: NTIS HC $7.75 CSCL 17B

The results are presented of work performed on the Space Shuttle Ku-Band Integrated Rendezvous Radar/Communications System Study. The recommendations and conclusions are included as well as the details explaining the results. The requirements upon which the study was based are presented along with the predicted performance of the recommended system configuration. In addition, shuttle orbiter vehicle constraints (e.g., size, weight, power, stowage space) are discussed. The tradeoffs considered and the operation of the recommended configuration are described for an optimized, integrated Ku-band radar/communications system. Basic system tradeoffs, communication design, radar design, antenna tradeoffs, antenna gimbal and drive design, antenna servo design, and deployed assembly packaging design

are discussed. The communications and radar performance analyses necessary to support the system design effort are presented. Detailed derivations of the communications thermal noise error, the radar range, range rate, and angle tracking errors, and the communications transmitter distortion parameter effect on crosstalk between the unbalanced quadriphase signals are included. Author

N76-22421*# Ohio Univ., Athens. Avionics Engineering Center.
AUTOMATIC NOISE LIMITER-BLANKER
R. W. Burhans May 1976 4 p ref
(Grant NGR-30-009-017)
(NASA-CR-147161; TM-27) Avail: NTIS HC $3.50 CSCL 17B

A blanker system that may be used with audio noise limiters or automatic noise limiters was described. The system employs a pair of silicon diodes and two RC filters connected across the feedback impedance of an operational amplifier so as to counteract impulse noise interference caused by local spherics activity or 60 Hz harmonics radiated from ac motor control systems. The following information is given: circuit diagram and description, operating details, evaluation, discussion of other noise blanking methods. Y.J.A.

N76-22422*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASUREMENTS OF WAVE HEIGHT STATISTICS AND RADAR, CROSS-SECTION IN A WIND WAVE TANK
J. W. Johnson and A. E. Cross 5 Mar. 1976 21 p
(NASA-TM-X-72834) Avail: NTIS HC $3.50 CSCL 17I

There is currently wide interest among oceanographers and meteorologists in remote sensing of ocean surface characteristics. A wind wave tank developed at Langley Research Center is used to evaluate various remote sensing techniques based on electromagnetic scattering phenomena, and in the development and evaluation of theoretical scattering models. The wave tank is described, the statistics of the rough water surface are documented, and microwave radar cross-section measurement results are presented. The water surface statistics are similar in key respects to the open ocean, and the microwave scattering measurements show, qualitatively, theoretically predicted large and small scale scattering effects. Author

N76-22423*# LinCom Corp., Pasadena, Calif.
CARRIER AND SYMBOL SYNCHRONIZATION SYSTEM PERFORMANCE STUDY
William C. Lindsey Apr. 1976 98 p refs
(Contract NAS9-14730)
(NASA-CR-147662; TR-04-7508-9) Avail: NTIS HC $5.00 CSCL 17B

Results pertinent to predicting the performance of convolutionally encoded binary phase-shift keyed communication links were presented. The details of the development are provided in four sections. These sections are concerned with developing the bit error probability performance degradations due to PN despreading by a time-shared delay locked loop, the Costas demodulation process, symbol synchronization effects and cycle slipping phenomena in the Costas loop. In addition, Costas cycle slipping probabilities are studied as functions of Doppler count time and signal-to-noise conditions. The effect of cycle slipping in the symbol synchronizer is also studied as a function of channel Doppler and other frequency uncertainties. Author

N76-22424*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TWENTY AND THIRTY GHz MILLIMETER WAVE EXPERIMENTS WITH THE ATS-6 SATELLITE
Louis J. Ippolito Washington Apr. 1976 144 p refs
(NASA-TN-D-8197; G-7649) Avail: NTIS HC $6.00 CSCL 17B

Studies at 11 locations in the continental United States were directed at an evaluation of rain attenuation effects, scintillations, depolarization, site diversity, coherence bandwidth, and analog and digital communications techniques using the Applications Technology Satellite-6(ATS-6). In addition to direct measurements on the 20- and 30-GHz links, methods of attenuation prediction with radars, rain gages, and radiometers were developed and compared with the directly measured attenuation. Initial data results of the ATS-6 millimeter wave experiment were presented. The first section describes the experiment objectives, flight hardware, and modes of operation. The remaining six sections present papers prepared by the major participating organizations in the experiment. The papers present a comprehensive summary of the significant results of the initial 11 months of ATS-6 experiment measurements and related radiometric, radar, and radio-meteorology studies. Author

N76-22425*# National Aeronautics and Space Administration, Washington, D.C.
COMMUNICATIONS TECHNIQUES AND EQUIPMENT: A COMPILATION Technology Utilization
Aug. 1975 36 p
(NASA-SP-5972(05)) Avail: NTIS HC $1.00 CSCL 17B

This Compilation is devoted to equipment and techniques in the field of communications. It contains three sections. One section is on telemetry, including articles on radar and antennas. The second section describes techniques and equipment for coding and handling data. The third and final section includes descriptions of amplifiers, receivers, and other communications subsystems. Author

N76-22426# Communications Research Centre, Ottawa (Ontario). Radio and Radar Branch.
EXPERIMENTS WITH A MOBILE X-BAND FM RADAR IN MEASURING THE THICKNESS OF FRESH-WATER ICE
G. O. Venier, F. R. Cross, and R. O. Ramseier Oct. 1975 41 p refs
(CRC-TN-673) Avail: NTIS HC $4.00

The feasibility of using a high resolution FM radar at X-band frequencies, for measuring the thickness of fresh water ice from a moving platform, was investigated in a series of field measurements during the winter of 1972/73. The radar was first mounted on a sled and towed over the ice by a snowmobile, and secondly, mounted on an air cushion vehicle and flown over the ice surface. The resolution capability of the radar was adequate for measuring a minimum ice thickness of 14 to 15 centimetres. Received signals were recorded on an audio magnetic tape recorder and processed in the laboratory using a digital computer as well as a slow sweep spectrum analyzer. The test results indicate that accurate ice thickness measurements can be carried out with a mobile X-band FM radar. Author

N76-22427# Telecom Australia Research Labs., Melbourne.
TRANSMISSION OF NON-TELEPHONY SIGNALS OVER TANDEM PCM CARRIER DERIVED VF CIRCUITS
G. J. Semple Aug. 1975 19 p
(Rept-7014) Avail: NTIS HC $3.50

The results are summarized of a series of measurements carried out to investigate the effect of tandem VF PCM carrier links on the transmission of nontelephony signals such as VF data, MFC, VFT and facsimile. The aim of the investigation was to examine the effects of the transmission impairments produced by the successive encoding/decoding operations performed by the PCM terminal multiplexing/demultiplexing equipment associated with the individual PCM links in a tandem connection. The measurements were performed in the laboratory on commercial primary level PCM multiplex equipment which comprised both 24 channel (1.544 Mbit/s) and 30 channel (2.048 Mbit/s) systems. Author

N76-22428# Wiggins (J. H.) Co., Redondo Beach, Calif.
DEMONSTRATION OF MULTISTATION/CSP CAPABILITY FOR RANGE CONTROL
R. T. Gabler and Jerold M. Haber 7 Apr. 1973 106 p refs Backup document for AIAA Synoptic, "Enhanced Tracking Capability through the Use of Multiple Stations and Doppler Radar", scheduled for publication in Journal of Spacecraft and Rockets in Aug. 1976
(Contract F04701-72-C-0147)
(TR-73-7005-1) Avail: NTIS HC $5.50

The required accuracy in impact prediction for range control purposes can be achieved only through better velocity estimation. Coherent signal processing (CSP) was developed to provide the C band radars with a Doppler or range rate capability and in a multistation solution to give the required better velocity estimate.

Even though various studies tend to show the possibility of substantial improvement through the use of multistation with Doppler solutions, very limited use has been made of multistation solutions for real time range control purposes. A primary purpose of this task was to develop the means for and evaluate the capability of CSP and a range instrumentation system for meeting the IIP requirements of range control. To make the evaluation as complete and definitive as necessary for the purpose, both random and systematic error in IIP were evaluated and for both nominal trajectories and for missile failure cases. Computer programs were developed to facilitate this evaluation. Author

N76-22429# Telecom Australia Research Labs., Melbourne.
A TECHNIQUE FOR SMOOTHING JUSTIFICATION JITTER IN DIGITAL SYSTEMS WITH LOW JUSTIFICATION RATES
J. A. Bylstra Jul. 1975 17 p refs
(Rept-6982) Avail: NTIS HC $3.50

A novel smoothing technique is described that is called the Equidistant Phase Adjustment (EPA) technique for the reduction of justification jitter in systems where two timing signals have to be synchronized to each other. The technique is designed for systems with low justification rates and is particularly useful in digital multiplexes with positive/negative justification. Author

N76-22430# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
A GRID ANTENNA ARRAY FOR THE VHF INCOHERENT SCATTER RADAR WITH DISCRETE BEAM DIRECTIONS
Martti Tiuri and Johan Henriksson 1975 23 p refs
(Rept-S-77; ISBN-951-750-546-9) Avail: NTIS HC $3.50

The possibility of using a grid antenna array as an antenna for 224 MHz incoherent scatter radar is considered. The proposed antenna consists of two separate intermixed arrays having orthogonal polarization. There are 51 pairs of 15 x 15 m grid element antennas. Each element is tiltable plus or minus 30 deg around the east-west horizontal axis. Tilting creates main lobes in the north-south plane about every 5 deg. Theoretical results for an array and a suitable element grid antenna are presented. Author (ESA)

N76-22431# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
A ONE-BIT CORRELATOR WITH A 60 MHz SAMPLING RATE FOR SPECTRAL STUDIES IN RADIOASTRONOMY
Kai Kurru 1975 37 p refs
(Rept-S-78; ISBN-951-750-573-6) Avail: NTIS HC $4.00

A digital signal processing system for the spectral studies of radioastronomical signals is discussed and the realization of a 128-channel one-bit correlator is presented. The spectrum of the received signal is translated to a proper band for the correlator. The center of the system is a minicomputer which controls the correlator and the directing of the antenna, the communication between the user and the computer being carried out by a teletypewriter. For output the system includes a recorder for the final documentation of the spectrum, a papertape punch for further data processing and a display unit to monitor the spectrum under investigation. The correlator operates with sampling rates up to 60 MHz. ESA

N76-22432# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
A NUMERICAL TECHNIQUE TO PREDICT SCATTERING FROM BODIES OF REVOLUTION (USER'S GUIDE FOR THE COMPUTER PROGRAM ROT2)
Ole Rydahl Dec. 1975 146 p
(Contract ESTEC-2290/74-HP)
(R-150; ESA-CR(P)-769) Avail: NTIS HC $6.00

A user manual is presented for a FORTRAN 4 program to calculate the scattered field from perfectly conducting bodies of revolution of arbitrary shape, e.g. satellite antennas. The electric field integral equation on which the calculation is based is obtained from the potential integrals plus the boundary conditions. A solution is effected by the method of moments. Due to the rotational symmetry it is possible to choose expansion and test functions that make the impedance matrix separate for each harmonic defined by the azimuthal variation, phi. The solution becomes a Fourier series in phi, each term of which is uncoupled to every other term. The expansion and test functions are subsectional and triangular in t (contour length). The two surface current components computed are directed along the tangent to the contour and in the azimuthal direction, respectively. ESA

N76-22433# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
ATMOSPHERIC EFFECTS ON ELECTROMAGNETIC WAVE PROPAGATION IN mm, cm, AND dm WAVELENGTHS. PART 1: RAY DEFLECTION
Manfred Eichler 10 Jun. 1974 106 p refs In GERMAN; ENGLISH summary 2 Vol.
(MBB-UFE-1101-O-Pt-1) Avail: NTIS HC $5.50

Models are presented for the refractive index which results as a function of altitude dependence of barometric pressure, temperature and humidity for the troposphere and the ionization for the ionosphere. A survey is given on the different ways to account for propagation errors. Not only exact solutions are considered, but also approximate results; both were obtained with little calculation effort. By an iterative determination of the target height it is possible to ascertain angle and range errors from radar data (distance, elevation angle). Using examples for the Central Radio Propagation Laboratory exponential atmosphere, the influence of the refractive index, refractive index gradient, and elevation angle on the refractive angle, angle and range errors is investigated. For Part 2; see ESR-96702. Author (ESA)

N76-22434# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
ATMOSPHERIC EFFECTS ON ELECTROMAGNETIC WAVE PROPAGATION IN (LC2)MM, (LC2)CM, AND (LC2)DM WAVELENGTHS. PART 2: ATTENUATION M.S. Thesis
Rolf Meyer 6 Jun. 1974 84 p refs In GERMAN; ENGLISH summary 2 Vol.
(MBB-UFE-1100-O-Pt-2) Avail: NTIS HC $5.00

Wave propagation in the real atmosphere is dealt with, particularly the attenuation caused by the absorption and dispersion of electromagnetic radiation. The influence of gases is investigated (water vapor and oxygen), precipitation (rain, snow, hail), clouds and fog. Diagrams and calculation methods are presented, with the aid of which, the propagation paths of waves in a diagonal direction, can be calculated as a function of height. An investigation is presented regarding the attenuation influence on range respectively the contrast of radio, navigation, and image-display systems in the microwave range. For Part 1; see ESR-96701. Author (ESA)

N76-22435# European Space Agency, Paris (France).
RADIOELECTRIC NOISE AND ITS INFLUENCE ON SIGNAL PROCESSING
Roger Gouillou Feb. 1976 40 p refs Transl. into ENGLISH of 'Etude du Bruit et de son Comportement dans les Recepteurs', ONERA, Paris Report ONERA-NT-231, 1974
(ESA-TT-262; ONERA-NT-231) Avail: NTIS HC $4.00

Radio frequency noise and the modifications to which it is subjected inside receivers is discussed. The characteristics of the noise, either by itself or superimposed on a signal are discribed. This is applied to the problem raised by the possible presence of a signal at a filter output and to the functioning of threshold detectors. The result of subjecting the signal and noise levels to the most common types of treatment is calculated: mixing, detection, correlation and discrimination. Results obtained are assembled in a list. These allow a precise determination of the performance of various communication systems. Author (ESA)

N76-22436# Melbourne Univ., Parkville (Australia). School of Physics.
ISOLATION OF PARAMETERS WHICH AFFECT ANOMALOUS RADIO PROPAGATION Final Report, Dec. 1972 - Jun. 1975
V. D. Hopper, I. A. Bourne, E. L. Unthank, and B. F. Whitting Oct. 1975 13 p refs
(Contract N00014-73-C-0181)
(AD-A018161) Avail: NTIS CSCL 20/14

This research project has attempted to isolate and identify the spatial and temporal variations of the meteorological parameters which affect propagation at centimetric wave-lengths across Bass Strait in south-eastern Australia. As a result it is

hoped to be able to predict propagation conditions from the synoptic situation at a given time. GRA

N76-22437# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MEASURING SOURCE LOCATION IN A STEADY-STATE WAVEGUIDE
Melvin J. Hinich Oct. 1975 17 p refs
(Contract N00014-75-C-0494; NR Proj. 042-315)
(AD-A018200; TR-4) Avail: NTIS CSCL 09/4

This paper presents a result which implies that a horizontal rather than a vertical array design is best for estimating the source depth in an infinite homogeneous horizontal waveguide. Since a horizontal array configuration is best for estimating the source bearing, the same horizontal array can be processed to estimate depth. The optimal array depth, however, for bearing estimation can be different from the optimal array depth for source depth measurement. In order to present these results, the physics of the received signal must be considered. GRA

N76-22438# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INTERACTION OF POLARIZABLE PARTICLES WITH AN ALMOST STATIONARY WAVE NETWORK
Guy Mayer 3 Mar. 1975 14 p refs Transl. into ENGLISH from Opt. Commun. (Netherlands), v. 8, no. 4, Aug. 1973 p 390-393
(AD-A017194; FTD-HC-23-0971-75) Avail: NTIS CSCL 20/14

In an electromagnetic field consisting of two waves (omega +) and (omega -) propagating in opposite directions, and having frequencies omega + 1/2 delta omega and omega - 1/2 delta omega, respectively, polarizable particles are dragged along in the direction of the (omega -) wave. The stimulated scattering of omega + photons into omega - photons supplies the medium with the energy to be dissipated against viscous forces. Conversely, if the p particles are forced into motion in a strictly stationary field, the ratio of the respective intensities of omega + and omega - will change. It is shown that these 'two-photons drag' effects, which are closely tied to fluctuation in scattering concentration, can be used to measure the number, size and mobility of charged or neutral particles dispersed in a host medium. GRA

N76-22439# Army Electronics Command, Fort Monmouth, N.J.
APPLICATION OF OPTICAL FARADAY EFFECT FOR EMP MEASUREMENTS
Hans A. Bomke and Milton Harmate Nov. 1975 78 p refs
(DA Proj. 1T1-61102-B-31A)
(AD-A017058; ECOM-4362) Avail: NTIS CSCL 20/14

Existing devices for measuring the electric and magnetic fields in EMP simulators cause considerable distortion of the fields to be measured. It was proposed to use magneto-optical sensors and to interrogate these sensors remotely with a light beam. In the present study, the feasibility of using the enhanced Faraday effect of optical resonance lines to measure the magnetic components of an EMP was investigated. It was found that rubidium and mercury are suitable Faraday substances. Magnetic fields of less than a tenth of a gauss can be measured. Observations concerning general characteristics of the enhanced Faraday effect were made. To record EMPs of nanosecond rise times with a Faraday sensor, light sources of extremely high intensity, e.g., pulsed gas discharges or lasers, are required. Design criteria for a practical EMP-measuring system of this type are discussed. A new ultra-narrow optical filter (bandwidth of 3 milliangstroms and peak transmission of 88 percent) is described. This filter may have applications in optical communication and in laser technology. GRA

N76-22440# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AMBIENT ELECTRON DENSITY PROFILES; PROJECT SECEDE 2 Final Report
William A. Dean Aug. 1975 89 p refs
(AD-A017078; BRL-1825) Avail: NTIS CSCL 20/14

Project SECEDE II was a series of high-altitude barium releases made at Eglin Air Force Base, Florida, during the period from 16 January to 2 February 1971. An RF transmission experiment using a rocket-borne beacon and four fairly widely separated ground-based receiving stations was one of several methods employed for making ion cloud diagnostic measurements. That function constituted the primary role of the RF transmission experiment. However, since the beacon rockets were programmed to fly behind the ion cloud, relative to the ground receiving stations, for only a short period of time when the beacon rocket was near apogee, a large amount of data for the ambient ionosphere was collected. A unique opportunity thus presented itself for making electron density measurements of the ambient ionosphere from data gathered over four widely separated propagation paths simultaneously. These measurements are the subject of this report. GRA

N76-22441# Bureau of Radiological Health, Rockville, Md.
MEASUREMENT OF POWER DENSITY FROM MARINE RADAR
D. W. Peak, D. L. Conover, W. A. Herman, and R. E. Shuping Jul. 1975 27 p refs
(PB-247765/1; DHEW/(FDA)-76-8004) Avail: NTIS HC $4.00 CSCL 06R

Theoretical predictions and empirical measurements of the magnitude of microwave power density radiating from small craft marine radar units are described. Results of an investigation of the microwave power density levels emanating from small craft marine radar units and the instrumentation and measurement techniques used are presented. Theoretically calculated and experimentally measured power densities from marine radar units are compared. GRA

N76-22442# BDM Corp., Albuquerque, N.Mex.
THE EMCAP (ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM) PROPERTIES OF THE BANDED MATRIX ITERATIVE SOLUTION TECHNIQUE FOR THIN WIRE MOMENTS PROBLEMS Phase Report, 2 Apr. - 1 Jul. 1975
T. R. Ferguson Nov. 1975 36 p refs
(Contract F30602-74-C-0182; AF Proj. 4540)
(AD-A018444; BDM/A-141-75-TR; RADC-TR-75-272) Avail: NTIS CSCL 20/14

Efficient solution of the linear simultaneous equations arising from thin wire moments problems by a banded matrix iterative technique has been demonstrated for a variety of small problems in previous reports. This report includes studies of stability of the equations, computation of residual errors in the iterative method, statistics on performance of a new convergence measure, prediction of efficiencies during the iteration, possibilities for control logic for the iteration with checkpoint/restart capabilities, and an attempt to accelerate convergence. Author (GRA)

N76-22443# Harry Diamond Labs., Adelphi, Md.
ELECTROMAGNETIC ASPECTS OF EMP TESTING
Egon Marx Oct. 1975 29 p refs
(DNA Proj. NWET-L37EAXEX431)
(AD-A018450; HDL-TM-75-14) Avail: NTIS CSCL 20/14

General considerations related to testing of complicated systems exposed to EMP by means of a simulator are presented, with special emphasis on the similarities and differences between the pulse generated by a high-altitude burst and the one generated by a simulator. Other aspects of a testing program are also discussed. Author (GRA)

N76-22444# Naval Postgraduate School, Monterey, Calif.
FACSIMILE COMMUNICATION IN THE FLEET MARINE FORCE A 'THIRD DIMENSION' IN TACTICAL COMMUNICATIONS M.S. Thesis
Kenneth Donald Johnson Sep. 1975 96 p refs
(AD-A018326) Avail: NTIS CSCL 17/2

The paper introduces the reader to facsimile communication by defining in simple terms the general modus operandi of facsimile communication and then comparing the capabilities of record (teletypewriter) communication with facsimile communication. The thesis discusses the inherent advantages of facsimile communication along with the limitations of analog facsimile technology. The requirement for facsimile communication in the Marine Corps is discussed, noting that there is a requirement for this 'third dimension' in tactical communications. A detailed discussion of recent digital facsimile technology is provided delineating the

advantages of digital facsimile technology over existing analog facsimile equipment. Alternative facsimile applications in the Fleet Marine Force are outlined and a broad concept of digital facsimile employment is proposed. GRA

N76-22445# Linkabit Corp., San Diego, Calif.
TROPOSCATTER CONVOLUTIONAL ENCODER-VITERBI DECODER Final Report, 28 Jun. 1973 - 11 Apr. 1975
Andrew R. Cohen and Keith M. Kumm Nov. 1975 56 p refs
(Contract DAAB07-73-C-0248; DA Proj. 1S7-62701-AH-92)
(AD-A018283; ECOM-73-0248-F) Avail: NTIS CSCL 17/2

The report covers the activities on a research and development program for a Troposcatter Convolutional Encoder-Viterbi Decoder (codec). The report contains physical and functional descriptions of the codec, a description of work accomplished during the reporting, conclusions, and recommendations. GRA

N76-22446# Washington Univ., Seattle. Dept. of Mathematics.
MINIMUM GRAPHS OF SPECIFIED DIAMETER, CONNECTIVITY AND VALENCE
Victor Klee and Howard Quaife Sep. 1975 11 p refs
(Contract N00014-67-A-0103-0003; NR Proj. 044-353)
(AD-A018476; TR-53) Avail: NTIS CSCL 17/2

The minimum order (number of nodes) is determined for c-connected graphs of valence less than or equal to v and diameter less than or equal to d. The question arises naturally from reliability and defense considerations that may enter into the design of an armed communication network. GRA

N76-22447# Naval Postgraduate School, Monterey, Calif.
DESIGN OF A REPEATER-JAMMER EXPERIMENT FOR A MONOPULSE RADAR M.S. Thesis
Michael Joseph Duncan Sep. 1975 43 p refs
(AD-A018309) Avail: NTIS CSCL 17/4

A current problem of interest in the Electronic Counter-Measures field is the deception of monopulse type radars. The operational evaluation of any deception device requires that some preliminary work be accomplished in order to establish what electronic devices are most suitable for the job and what specific parameters these devices must meet. This paper investigates the feasibility of installing a monopulse deception repeater on board a steel-hulled ship, the RV ACANIA. The specific parameters investigated are the peak power required for deception and the electronic gain required of the repeater loops. Prior to calculation of these parameters it was necessary to determine the radar cross section of the ship test platform and to measure the antenna isolation to insure its adequacy to prevent destructive feedback of the repeater loops. Successful completion of these experiments enabled one to specify that a traveling wave tube amplifier with a power output of 60 dbM and a gain of 53 db would be an appropriate device for the loop amplifiers.
Author (GRA)

N76-22448# General Electric Co., Syracuse, N.Y. Military Equipment Dept.
AN EVALUATION OF HF IONOSPHERIC BACKSCATTER ECHOES
George H. Millman Nov. 1975 121 p refs
(AD-A018229; R75EMH19) Avail: NTIS CSCL 17/9

The characteristics of HF radar echoes reflected from ionization irregularities aligned along the lines of force of the earth's magnetic field are discussed. The spatial-geographical extent of ionospheric backscatter echoes is estimated for an HF radar located in the midlatitudes with the antenna beam oriented toward the polar region. Utilizing experimental radar-ionospheric data acquired at frequencies between HF and UHF, an analysis is made of the amplitude and the cross-sectional area statistics of HF field-aligned echoes. The Doppler frequency variation, the frequency of occurrence and the diurnal and seasonal variation of ionospheric backscatter echoes and their correlation with solar geophysical conditions are also discussed. Author (GRA)

N76-22449# Harry Diamond Labs., Adelphi, Md.
AUTOVON NETWORK MODEL
Egon Marx Nov. 1975 28 p
(DNA Proj. NWET-L37EAXEX431)
(AD-A018477; HDL-TR-1718) Avail: NTIS CSCL 17/2

A faithful GPSS model of the CONUS AUTOVON network is compared to the actual processing of long-distance calls by the network. It includes all 70 switches, about 60 multiple-homed PBX's, the actual routing instructions, 5 levels of priority, and preemption. By a series of runs, a method is tested for (a) the improvement of the routing instructions within the home grid of a multiple-homed PBX, (b) the study of how a heavy background load of routine traffic affects a surge of priority calls, and (c) the study of how the elimination of a block of 12 switches in the center of the network affects coast-to-coast traffic. GRA

N76-22450# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A THEORETICAL STUDY OF CORNER REFLECTOR APPLICATIONS Final Report
R. D. Shelton and M. E. Graham Nov. 1975 64 p
(DA Proj. 1T1-61101-A-91A)
(AD-A018529; BRL-1843) Avail: NTIS CSCL 17/9

A corner reflector, consisting of three mutually perpendicular mirrors in the form of isosceles right triangles with legs of length L, was studied to determine what tracking information might be available if it were installled in the rear of a projectile. The degree of modulation of the retroreflected light has been determined as a function of attitude relative to the line of sight. The Doppler shift associated with the rotation of the corner reflector is shown to be zero to first order. In addition a number of other fundamental properties of corner reflectors are demonstrated. GRA

N76-22451# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MEASUREMENT OF THE REFLECTION COEFFICIENT OF POWERFUL SHF PULSE EMISSION FROM AN UNSTEADY LOAD
V. I. Barinov, M. R. Gekker, V. A. Ivanov, and D. M. Karfidov 21 Nov. 1975 23 p refs Transl. into ENGLISH from Akad. Nauk SSSR. Fiz. Inst. (USSR), no. 53, 1974 p 1-29
(AD-A018471; FTD-ID(RS)I-2233-75) Avail: NTIS CSCL 20/14

This report discusses measuring the coefficient using a directional coupler with weak coupling which, being switched on sequentially in the wave guide channel, can react only on the passing or reflected superhigh frequency wave. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N76-22452 Duke Univ., Durham, N.C.
DESIGN OF ENERGY STORAGE REACTORS FOR dc-TO-dc CONVERTERS Ph.D. Thesis
De Yu Chen 1975 188 p
Avail: Univ. Microfilms Order No. 76-8733

Two methodical approaches to the design of energy-storage reactors for a group of widely used dc-to-dc converters were presented. One of these is based on a steady-state time-domain analysis of piecewise-linearized circuit models of the converters, while the other is based on an analysis of the same circuit models from an energy point of view. The design procedure developed from the first approach includes a search through a stored data file of magnetic core characteristics and results in a list of usable reactor designs which meet a particular converter's requirements. A digital computer usually is used to implement the design algorithm. The second approach, based on a study of the storage and transfer of energy in the magnetic reactors, leads to a relatively simple and straightforward design procedure which can be implemented rather quickly with hand calculations. The heart of this procedure is a specially constructed table of magnetic core characteristics. Dissert. Abstr.

N76-22453 Syracuse Univ., N.Y.
TRANSIENT RESPONSE OF CONDUCTIVE SURFACES BY THE METHOD OF MOMENTS Ph.D. Thesis
Richard Lee Moore 1975 159 p
Avail: Univ. Microfilms Order No. 76-7603

Direct time domain solutions for the currents on conductive surfaces are considered. The problem is formulated in terms of an integral equation, the continuity equation, and the boundary condition on the surface. The method of moments is then applied to these equations to obtain a system of equations in terms of the currents. The integral formulation of the electric field avoids the computational errors inherent in the use of finite differences to approximate the electric field from the vector and scalar potentials. The formulation satisfies the continuity equation for all time and space exactly without the use of finite differences. The method employs point-matching and the currents are expanded into a four dimensional series of linearly independent basis functions. The time dependency of the current basis function is triangular. The conductive surface is subdivided into rectangles the centers of which may be placed arbitrarily in space. Dissert. Abstr.

N76-22454 Missouri Univ., Columbia.
POWER SYSTEM STABILITY STUDY WITH DYNAMIC LOAD Ph.D. Thesis
Kojornsak Hotrabhavananda 1975 150 p
Avail: Univ. Microfilms Order No. 76-7505

Normally loads can be classified into three major types: constant impedance, constant current, and constant power. Each type can cause variations in the characteristics of power system stability swings. The differences in magnitude of swing, frequency of oscillation, and damping factor were investigated. System voltage and frequency swing during disturbances of the system with composite load characteristics were investigated. These investigations lead to an understanding of load behavior with voltage and frequency dependency functions during disturbances and how it should be represented. Comparison runs were made using analytical calculation, digital simulation, and hybrid simulation. An analog load representation that can respond to voltage and frequency variations for the hybrid simulation was implemented. The hybrid simulation techniques are discussed. Dissert. Abstr.

N76-22455 Texas Technological Univ., Lubbock.
A SPECTRAL THEORETIC APPROACH TO FAULT ANALYSIS IN LINEAR SEQUENTIAL CIRCUITS Ph.D. Thesis
Suresh Himatlal Sangani 1975 70 p
Avail: Univ. Microfilms Order No. 76-7388

The problem of fault analysis in linear and affine sequential circuits is treated. These classes of systems provide for the treatment of several linear and nonlinear faults common in digital circuitry. The solution to the linear and affine sequential circuit fault analysis problem is obtained via the development of a spectral theory for such systems over finite fields. A stepwise fault analysis procedure for this problem class is presented along with many examples illustrating the advantages that memory provides in digital fault analysis. Dissert. Abstr.

N76-22456 Michigan Univ., Ann Arbor.
PROPERTIES OF SILICON IMPATT DEVICES Ph.D. Thesis
Mohamed Mohamed Seddik 1975 339 p
Avail: Univ. Microfilms Order No. 76-9508

A close correlation between theory and experiment in silicon IMPATT diodes was studied, and different new devices structures, such as doubledrift diodes and different forms of modified Read structures in Si were explored. A computer model is used which incorporates the material and device parameters in a realistic manner without resorting to approximations which limit the scope of its applications. This is important in order to determine theoretically the optimum performance achievable in Impatt devices and to compare theoretical and experimental results. The effects upon the diode characteristics of material parameters, such as ionization rates, drift velocities and diffusion coefficients of the electrons and holes as functions of electric field, are presented. The significance of using different material parameters in Impatt devices performing under dc and small- and large-signal conditions is studied. Dissert. Abstr.

N76-22457 Duke Univ., Durham, N.C.
ANALYSIS AND APPLICATIONS OF TWO CONDUCTOR MICROWAVE TRANSMISSION LINES WITH INHOMOGENEOUS MEDIA Ph.D. Thesis
Eiji Tanabe 1975 122 p
Avail: Univ. Microfilms Order No. 76-8784

The transmission medium is made inhomogeneous in the transverse direction for one type and in the longitudinal direction for the other type by putting together layers or sections of homogeneous material. The reciprocal relations between electric field and magnetic field in the inhomogeneous dielectric and magnetic media are derived and applied to the calculations of transmission line parameters such as characteristic impedance, phase velocity, phase constant, and attenuation factor. These parameters can be obtained from the effective relative dielectric constant, effective relative permeability, and geometrical function of the line. Example calculations of the parameters for certain dimensions of coaxial line and microstrip line inhomogeneous media are carried out by digital computer using the relaxation method. The theoretical and experimental values obtained are compared up to X-band frequencies. Dissert. Abstr.

N76-22458*# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Electrical Engineering.
MICROELECTRONIC COMPONENTS AND METALLIC OXIDE STUDIES AND APPLICATIONS Final Report, 1 Jun. 1970 - 31 Mar. 1976
Leo Williams, Jr. Apr. 1976 56 p refs
(Grant NGR-34-012-004)
(NASA-CR-147156) Avail: NTIS HC $4.50 CSCL 09C

The project involved work in two basic areas: (1) Evaluation of commercial screen printable thick film conductors, resistors, thermistors and dielectrics as well as alumina substrates used in hybird microelectronics industries. Results of tests made on materials produced by seven companies are presented. (2) Experimental studies on metallic oxides of copper and vanadium, in an effort to determine their electrochemical properties in crystalline, powder mixtures and as screen printable thick films constituted the second phase of the research effort. Oxide investigations were aimed at finding possible applications of these materials as switching devices memory elements and sensors. Author

N76-22459*# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
GATE-CONTROLLED-DIODES IN SILICON-ON-SAPPHIRE: A COMPUTER SIMULATION Interim Report
J. D. Gassaway 8 Sep. 1974 83 p refs
(Contract NAS8-26749)
(NASA-CR-144246; EIRS-EE-75-1) Avail: NTIS HC $5.00 CSCL 09C

The computer simulation of the electrical behavior of a Gate-Controlled Diode (GCD) fabricated in Silicon-On-Sapphire (SOS) was described. A procedure for determining lifetime profiles from capacitance and reverse current measurements on the GCD was established. Chapter 1 discusses the SOS structure and points out the need of lifetime profiles to assist in device design for GCD's and bipolar transistors. Chapter 2 presents the one-dimensional analytical formula for electrostatic analysis of the SOS-GCD which are useful for data interpretation and setting boundary conditions on a simplified two-dimensional analysis. Chapter 3 gives the results of a two-dimensional analysis which treats the field as one-dimensional until the silicon film is depleted and the field penetrates the sapphire substrate. Chapter 4 describes a more complete two-dimensional model and gives results of programs implementing the model. Author

N76-22460*# Hughes Aircraft Co., Culver City, Calif. Aerospace Groups.
CONTAMINATION CONTROL IN HYBRID MICROELECTRONIC MODULES Interim Report
R. P. Himmel Jan. 1976 39 p ref
(Contract NAS8-30876)
(NASA-CR-144269; P76-54) Avail: NTIS HC $4.00 CSCL 09C

Thin and thick film test specimens were utilized to study the effects of silicone and epoxy hybrid microcircuit coatings on 0.025 mm diameter aluminum and gold ultrasonic bonds, and

0.051 diameter gold pulsed-thermocompression bonds. Chip-to-substrate and substrate-to-substrate geometries were included. Because sealed packages were utilized, a test pattern design was incorporated that allowed the determination of bond failures by making resistance measurements external to the package after the various environmental tests. All wire bonds were non-destructively pull tested prior to sealing. Tests included the PIN test, temperature cycling, and high temperature storage. Author

N76-22461*# Xerox Electro-Optical Systems, Pasadena, Calif.
SINGLE PHASE INVERTER FOR A THREE PHASE POWER GENERATION AND DISTRIBUTION SYSTEM Final Technical Report
S. J. Lindena Jan. 1976 138 p ref Prepared for JPL
(Contracts NAS7-100; JPL-954272)
(NASA-CR-146905; FTR-2343) Avail: NTIS HC $6.00 CSCL 09C

A breadboard design of a single-phase inverter with sinusoidal output voltage for a three-phase power generation and distribution system was developed. The three-phase system consists of three single-phase inverters, whose output voltages are connected in a delta configuration. Upon failure of one inverter the two remaining inverters will continue to deliver three-phase power. Parallel redundancy as offered by two three-phase inverters is substituted by one three-phase inverter assembly with high savings in volume, weight, components count and complexity, and a considerable increase in reliability. The following requirements must be met: (1) Each single-phase, current-fed inverter must be capable of being synchronized to a three-phase reference system such that its output voltage remains phaselocked to its respective reference voltage. (2) Each single-phase, current-fed inverter must be capable of accepting leading and lagging power factors over a range from -0.7 through 1 to +0.7. Author

N76-22462*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NOTCH FILTER Patent Application
Glenn B. Shelton, inventor (to NASA) (Sperry Rand Corp., Huntsville, Ala.) Filed 14 Apr. 1976 10 p Sponsored by NASA
(NASA-Case-MFS-23303-1; US-Patent-Appl-SN-676957) Avail: NTIS HC $3.50 CSCL 09A

A notch filter is described for the selective attenuation of a narrow band of frequencies out of a larger band. A helical resonator is connected to an input circuit and an output circuit through discrete and equal capacitors, and a resistor is connected between the input and the output circuits. NASA

N76-22463# Telecom Australia Research Labs., Melbourne.
DIGITAL CIRCUITRY FOR A 140 M BIT/S REGENERATIVE REPEATER
A. Y. C. Quan Sep. 1975 25 p refs
(Rept-7021) Avail: NTIS HC $3.50

Different types of digital circuitry suitable for use in a regenerative repeater are described. The digital circuits finally employed were chosen because of their simplicity, reliability of operation and low power consumption. Author

N76-22464# Oak Ridge National Lab., Tenn.
POWER SYSTEM EMP PROTECTION
J. H. Marable, P. R. Barnes, and D. B. Nelson May 1975 85 p refs
(Contract W-7405-eng-26)
(ORNL-4958) Avail: NTIS HC $5.45

Voltage transients induced in electric power lines and control circuits by the electromagnetic pulse (EMP) from high-altitude nuclear detonations may cause widespread power failure and damage in electric power systems. This report contains a parametric study of EMP power line surges and discusses protective measures to minimize their effects. Since EMP surges have considerably greater rates of rise than lightning surges, recommended standards and test procedures are given to assure that surge arresters protect equipment from damage by EMP. Expected disturbances and damage to power systems are reviewed, and actions are presented which distribution companies can take to counter them. These include backup communications methods, stockpiling of vulnerable parts, repair procedures, and dispatcher actions to prevent blackout from EMP-caused instabilities. A long-range program is presented for improving distributors' protection against EMP. This involves employee training, hardware protection for power and control circuits, and improvement of plans for emergency action. Author (NSA)

N76-22465# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
EXPERIMENTAL RESULTS WITH SL/NL BREAKERS
W. Amenda, M. Pillsticker, and M. Soel Jan. 1975 51 p In GERMAN
(IPP-4/128) Avail: ERDA Depository Libraries HC $5.75

The switching-off effect of a superconductive/normal conductive (SC/NC)-breaker (cryotron) is based on the increase of the resistance from 0 to a determined value, if the transition from the superconductive to the normal conductive state is triggered. The fast commutation of a current from one branch of a network to another can be started by the switching-off effect of a SC/NC-breaker. Results of several tests with SC/NC-breakers suitable for high currents up to 800 A are reported. The relation between the switching time or the commutation time and the rise time of the trigger current pulse, the energy of the pulse, the direct current of the breaker before triggering and a few other electrical parameters are determined experimentally. The demonstration that during commutation an intrusion of electrical energy from the trigger-pulse-circuit into the main circuit never can be compensated completely is an important result of the measurements. Author (NSA)

N76-22466# Siemens A.G., Munich (West Germany). Zentrallab. fuer Nachrichtentechnik.
LOW NOISE DOWN CONVERTER FOR 27.5 GHz TO 31 GHz FREQUENCY RANGE [RAUSCHARMER ABWAERTSUMSETZER FUER DEN FREQUENZBEREICH 27,5 GHz BIS 31 GHz]
Rosmarie Boehm and Michael Krefft Bonn Bundesmin. fuer Forsch. u. Technol. Oct. 1975 80 p refs In GERMAN; ENGLISH summary
(Contract GfW-RV-11-V-15/73-TI-20)
(BMFT-FB-W-75-19) Avail: NTIS HC $5.00; ZLDI, Munich DM 16.80

The development of converters in waveguide form for satellite receivers, converting a signal of 1 GHz bandwidth in the range of 27.5 GHz - 31 GHz to an intermediate frequency range of 1 GHz - 2 GHz, is reported. A single ended mixer consists of a directional filter which combines oscillator- and signal power, and a mixermount which contains both the diode with its matching elements and the IF-output. In the balanced mixer, combination of the oscillator and the signal power and subsequent distribution to the diode mounts is achieved by a folded magic T. The IF-power derived from the two diodes is combined by a T-shaped coaxial line. The development of a wafer has been undertaken to improve the broadband matching of the diodes. Author (ESA)

N76-22467# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
THE EFFECTS OF A TEMPERATURE DEPENDENT THRESHOLD FIELD ON TRANSFERRED ELECTRON OSCILLATIONS
David E. Meharry 1975 6 p refs
(Rept-S-76; ISBN-951-750-538-8) Avail: NTIS HC $3.50

The influence of a temperature dependence in the threshold field of a Transferred Electron Device (TED) was added to an analytical model of a TED previously developed for the investigation of the characteristics of quenched domain oscillations, and modified to account for the effects of diffusion. It is found that the bias voltage dependence of TED admittance changes little, while the temperature dependence is markedly modified.
Author (ESA)

N76-22468# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
COMPUTING SYMBOLIC NETWORK FUNCTIONS BY THE DERIVATIVE METHOD
Matti Ilmonen 1975 24 p refs
(Rept-S-79; ISBN-951-750-595-7) Avail: NTIS HC $3.50

A numerical non-topological method to compute symbolic network functions of linear, active, time-invariant networks, in terms of the frequency and/or network parameters is described.

The method, in principle, is related to the Pade-approximation. However, required network functions can be directly presented in the rational form, when the derivatives are known.
Author (ESA)

N76-22469# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
EXPLICIT DESIGN FORMULAS FOR BRANCH-GUIDE DIRECTIONAL COUPLERS
Martti E. Valtonen 1975 27 p refs
(Rept-S-80; ISBN-951-750-603-1) Avail: NTIS HC $4.00

Explicit design formulas for symmetrically and asymmetrically loaded branch-guide directional couplers are derived with the aid of quarter-wave transformer prototypes. The design method is based on the synthesis of two-port networks consisting of cascaded commensurate transmission lines and shunt frequency-invariant susceptances. The present couplers are compared with previously used couplers. The comparison shows similar results for weakly coupled devices and slightly inferior results in the present case for strong coupling. However, the element value variation of the present devices having tight coupling is substantially smaller than that given for previous couplers. Author (ESA)

N76-22470# Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
[ACTIVITIES OF THE ELECTROMAGNETICS INSTITUTE FOR THE ACADEMIC YEAR 1 AUGUST 1974 - 31 JULY 1975] Annual Report
Jul. 1975 39 p refs
(D-272) Avail: NTIS HC $4.00

Organization, personnel, and teaching activities are discussed. Contracts and grants are listed. Research projects on propagation, antennas, equipment and systems, microwave techniques, electromagnetic theory, remote sensing, and fiber optical communication are dealt with, and missions and meetings are listed. ESA

N76-22471# Army Electronics Command, Fort Monmouth, N.J.
TRANSDUCTION OF ACOUSTIC SURFACE WAVES BY INTERDIGITAL ARRAYS, AND EQUIVALENT CIRCUIT REPRESENTATIONS
Arthur Ballato Oct. 1975 57 p
(DA Proj. 1S7-62705-AH-94)
(AD-A016915; ECOM-4359) Avail: NTIS CSCL 09/1

Analog network representations are given for crossed-field and in-line excitation of acoustic surface waves on piezoelectric crystals. Advantages of the analog formulation of the circuits are discussed and compared with earlier models. Enhanced physical insight, flexibility in adapting the circuits to describe modifications in device structure, and a rational approach to the approximation problem are the primary motivations for adopting models of this kind. Appendices describe electric field calculations, lumped element transmission line approximations, and piezoelectric forces produced by electrode arrays. GRA

N76-22472# Westinghouse Research Labs., Pittsburgh, Pa.
HIGH POWER MICROWAVE FIELD EFFECT TRANSISTOR DEVELOPMENT Final Technical Report, 1 Oct. 1973 - 30 Sep. 1974
M. C. Driver, M. J. Geisler, H. Yamasaki, D. L. Barrett, and J. G. Oakes Aug. 1975 63 p refs
(Contract F30602-74-C-0055; AF Proj. 5573)
(AD-A016432; RADC-TR-75-190) Avail: NTIS CSCL 09/1

Work is concentrating on gallium arsenide devices rather than silicon to take advantage of the higher mobility. Two fabrication techniques are being used to construct arrays of unit cells on GaAs wafers. The first technique requires realignment of multiple photomasks and has given the best performance but is more costly. The second technique uses only one photomask and the gate is self-aligned between the source and drain metalization. Both unit cells are designed for approximately one watt. The realigned cell has an active length of 1,500 microns, and measures about 8 mils by 12 mils. This cell was tested at 3.5 GHz with .6 watts output, 18 db of gain, and 15% efficiency. The efficiency would be much improved in a better test fixture. The self-aligned gate cell has an active length of 2,500 microns and measures 12.5 mils by 17 mils. This cell was tested at 4 GHz with one watt of power output, 6 db of gain and 39% drain efficiency or 34.7% overall efficiency. GRA

N76-22473# Universal Computer Applications, Palo Alto, Calif.
COMPUTER AIDED DESIGN FOR DUAL-MODE CFA CROSSED-FIELD AMPLIFIERS Final Report, 15 May 1973 - 15 Jun. 1974
Gerald P. Kooyers, Elden K. Shaw, and Patricia A. Vartanian Jul. 1975 134 p refs
(Contract DAAB07-73-C-0185; DA Proj. 1S7-62705-AH-94)
(AD-A018029; ECOM-73-0185-F) Avail: NTIS CSCL 09/5

This is the final report in a year-long computer aided study of dual mode, crossed-field amplifiers (CFA). Dual-mode operation of injected beam CFA's (IBCFA) is discussed and two paper designs presented. A complete description is included of the mathematical analysis and computer program developed to study both the interaction region and gun region of the IBCFA. The results of an analysis of grid structures are presented including conventional, shadow and dual mode grid structures. Finally, general conclusions and recommendations are discussed. GRA

N76-22474# Radio Corp. of America, Camden, N.J. Government Communications and Automated Systems Div.
LOW POWER SOLID STATE RADIO FREQUENCY (RF) SWITCH Final Report, 1 Nov. 1974 - 1 Jun. 1975
R. Dawson and D. W. Wern Jun. 1975 117 p
(Contract DAAB07-75-C-0098)
(AD-A018085; ECOM-0098-F-75) Avail: NTIS CSCL 09/5

This report describes the investigation of the performance, under high input signal conditions, of the TC-1071 Solid State RF Switch developed under Contract DAAB07-73-C-0087 in 1973 by RCA Corp. This switch is intended for small signal applications, primarily in the 30-80 MHz band, such as receiver band switching in radios such as the AN/URC-78. The switch is an N-channel MOS-FET having low insertion loss in a 50-ohm system by virtue of a very low channel resistance when conductive. Testing of this device in the previous contractual effort revealed performance of the device complaint to specifications with the exception of the requirement that the device not be destroyed in the presence of a -38 dBm input when in the non-conductive mode. This contract has been devoted to investigating the failure mode under these conditions. The investigation has revealed the need to redesign the circuit used and to optimize the biases applied so as to minimize current drain and power dissipation under the high input conditions. In addition, heat sinking of the device has been found necessary. Compliance testing of the device with the modified circuit and biases has resulted in meeting all required performance specifications including that of -38 dBm input levels without degradation in performance. To support the testing program, devices were fabricated to the original design. Sample devices were supplied to ECOM as a program output. GRA

N76-22475# Reliability Analysis Center, Griffiss AFB, N.Y.
MICROCIRCUIT DEVICE RELIABILITY. DIGITAL GENERIC DATA
Roy C. Walker 1975 259 p
(Contract F30602-73-C-0065)
(AD-A014537; RAC-MDR-1) Avail: NTIS CSCL 09/5

The Microcircuit Device Reliability compendium provides failure rates on digital monolithic microcircuits. Long-term part-level test and equipment-level operational test and field data collected industry-wide by the Reliability Analysis Center are analyzed and organized by generic device properties. The parameters of MIL-HDBK-217B have been incorporated into the entries to permit comparisons with predicted values. Summarized failure rates are presented on field data, part-level test data, equipment-level checkout data, equipment-level reliability demonstration data, and logic-type. GRA

N76-22476# California Univ., Los Angeles.
LONG TERM MEMORY IN JUNCTION DEVICES USING MULTIVALENT TRAPPING IMPURITIES IN SILICON Final Report, 1 Feb. - 30 Jun. 1975
George Domingo, James W. Holm-Kennedy, William Kingsley, and James G. Nash Oct. 1975 99 p refs
(Contract DAAB07-73-C-0306; DA Proj. 1S7-62705-AH-94R)
(AD-A018213; UCLA-ENG-7575; ECOM-73-0306-F) Avail:

NTIS CSCL 09/1

Various multivalent dopants were investigated with the goal of obtaining nonvolatile multilevel memory devices in silicon using the Field Induced Trapping (FIT) effect. The test structures included Schottky diodes and resistive bars fabricated in silicon substrates suitably doped with multivalent dopants. Novel device effects were observed and are described. A model for a negative differential resistance Schottky barrier oscillator is proposed. Oscillations with frequencies voltage turnable over three decades were observed. Thermal switching in resistive bars is described and a theoretical treatment presented. Two separate models employing entirely different mechanisms are analyzed. A theoretical treatment on trapping effects in p-n junctions under low injection conditions is presented. Author (GRA)

N76-22477# Federal Pacific Electric Co., Sanford, N.C.
PRODUCTION ENGINEERING MEASURE FOR CAPACITORS, ELECTROLYTIC ALUMINUM HIGH RELIABILITY, HIGH VOLTAGE Cornell-Dubilier Electronics Div.
John E. Hand and George S. Papadopoulos 4 Jul. 1975 218 p
(Contract DAAB05-69-C-0020)
(AD-A018554) Avail: NTIS CSCL 09/1

Production engineering measures for improving production techniques to increase the reliability of high voltage, high temperature aluminum electrolytic capacitors have been completed. The required number of capacitors for each contract item were life tested at 85C for 10,000 hours. There were 9,400 capacitors on the extended life test. Reliability for CU13 and CU17 capacitors and contract item 2AG rated 1.5 mfd - 400 V are shown. The verification testing, which was performed at 125 C on 40 capacitors for each contract item, met the requirements of MIL-C-39018A. It further demonstrated that in addition to CU13 styles which are designed to operate at 125 C, the CU17 manufactured for this contract are capable of operating at 125C with derated voltage. Process specifications and Quality Control Manual are included. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N76-22478 Utah Univ., Salt Lake City.
THE EFFECTS OF ACOUSTIC WAVES ON TURBULENCE Ph.D. Thesis
Richard Jere Zeamer 1975 198 p
Avail: Univ. Microfilms Order No. 76-8663

An analysis based on experimental data was developed using the equations of motion and mathematical models of acoustic waves and turbulence. Solutions were obtained in terms of turbulent vorticity. As efforts to measure vorticity have not been practical to date, relationships were derived from theory to transform vorticity into turbulent kinetic energy and turbulent shear stress. The results show that acoustic waves impinging on turbulence in uniform steady flow would cause small increases, but if shear were present in the flow field, turbulence would be stimulated or damped. The sign and magnitude of this effect was shown to depend on a function of the velocity gradient, the acoustic wave number and the wave number at the peak of the turbulent energy spectrum. A different analysis approach was used for the turbulent boundary layer in the region close to the wall where experimental data indicated that acoustic waves were changing the production of new turbulence. Dissert. Abstr.

N76-22479 Purdue Univ., Lafayette, Ind.
A FINITE ELEMENT FORMULATION FOR THERMAL STRESS ANALYSIS Ph.D. Thesis
George Alkiviadis Keramidas 1975 178 p
Avail: Univ. Microfilms Order No. 76-7089

The basic equation is formulated for the development of a finite element model which can be used for solving problems related to heat conduction and/or thermal stresses. The formulation is based on the introduction of a new quantity, defined as heat displacement and related to temperature in the same manner as the mechanical displacement is related to strain. The introduction of such a quantity allows for writing the heat conduction equation in a form equivalent to the equation of motion, thus, the law of heat conduction can be regarded as an equilibrium equation. This equation is used to write a variational principle which together with the concept of generalized coordinates, yields a set of differential equations with the time as the independent variable. These equations are presented in a form equivalent to the one of the Lagrangian equations in mechanics. Dissert. Abstr.

N76-22480 Johns Hopkins Univ., Baltimore, Md.
WAVE-INDUCED INSTABILITIES IN STRATIFIED FLUIDS Ph.D. Thesis
Richard Paul Mied 1972 59 p
Avail: Univ. Microfilms Order No. 76-8493

The small-scale instability is studied of the flow field produced by two internal gravity waves propagating at angles + or - alpha to the vertical in a fluid with constant ambient Brunt-Vaisala frequency N. A Richardson number is defined using the superposition of the velocity fields of each of the waves (to yield a net velocity); the stability frequency is composed of the ambient N and those modifications of the ambient density structure arising from the wave motions. The analysis is extended to treat the possible Kelvin-Helmholtz instability among three interacting waves. If two of these waves are at their maximum amplitude and the third is growing from zero amplitude, the ratio of the period of this last wave to its interaction time is delta.
Dissert. Abstr.

N76-22481 Johns Hopkins Univ., Baltimore, Md.
STRUCTURE OF THE TURBULENCE IN THE PLANE WAKE BEHIND A HEATED FLAT PLATE Ph.D. Thesis
Syed Firasat Ali 1975 138 p
Avail: Univ. Microfilms Order No. 76-8506

A slightly heated plane turbulent wake was obtained behind a flat plate in incompressible air flow. Hot-wire measurements were carried out to obtain the conventional averaged quantities, the intermittency properties and the conditional turbulent and non turbulent zone averages of velocity and temperature and their fluctuations. On the basis of the measurements obtained, the question of self-preservation was examined and a limited self-preservation was found with some qualifications. In order to verify the approach of the flatplate-wake to a universal plane turbulent wake structure, the results were compared with the existing data for the wake of a circular cylinder. The large scale turbulence structure and its role in momentum and heat transfer were studied by measuring two point space time correlations involving temperature, and streamwise and normal velocity fluctuations. Dissert. Abstr.

N76-22482 Iowa State Univ. of Science and Technology, Ames.
A FINITE-DIFFERENCE ANALYSIS OF TURBULENT, AXISYMMETRIC, BUOYANT JETS AND PLUMES Ph.D. Thesis
Imtiaz Kamil Madni 1975 239 p
Avail: Univ. Microfilms Order No. 76-9596

A differential approach for analysis of the behavior of turbulent, axisymmetric, buoyant jets and plumes is presented, where the boundary layer form of the governing differential equations, derived in a curvilinear, orthogonal coordinate system, is solved numerically in the physical plane by an explicit finite-difference scheme of the DuFort-Frankel type. The turbulent shear stress and heat flux terms appearing in the governing equations are evaluated using an eddy viscosity model, which is generalized to include important effects such as ambient turbulence and buoyancy on turbulent mixing. The turbulent Prandtl number used to relate the turbulent exchange of heat and momentum is kept constant at 0.7 for all calculations reported. Dissert. Abstr.

N76-22483 George Washington Univ., Washington, D.C.
CALCULATION OF IMPULSE RESPONSE TO A PSEUDO-RANDOM BINARY SIGNAL IN A TWO STIRRED TANK PROCESS Ph.D. Thesis
Frank Palmer Schlosser 1973 111 p

Avail: Univ. Microfilms Order No. 76-7765

A simple heat transfer process assembled for various studies of automated process control in the laboratory was selected to determine if the pseudo random binary signals transmitted to a heater in a stirred tank would produce a variation in the temperature of the water in a second stirred tank, such that the temperature could be correlated to the heat input to identify the system impulses response. All of the information necessary to characterize a linear process is contained in the impulse response. The method for determining this impulse response is based on statistical theory relating the spectral density of white noise with the cross correlation function of the output of the system with a delayed version of the input. The pseudo random signal acts like white noise, since it has a constant spectral density over a broad band of frequencies. Dissert. Abstr.

N76-22484 Missouri Univ., Columbia.
FREE CONVECTION HEAT TRANSFER TO NON-NEWTONIAN RHEOLOGICAL DILATANT FLUIDS FROM A HORIZONTAL CYLINDER Ph.D. Thesis
Chong Bo KIM 1975 194 p
Avail: Univ. Microfilms Order No. 76-7514

The laminar free convection heat transfer between a horizontal cylinder and non-Nwetonian, rheological dilatant fluids is studied. Surface boundary conditions considered are constant heat flux and isothermal. The cylindrical model employed in this investigation consists of twenty aluminum segments each independently heated by resistance strips bonded to the interior surface. Concentrated corn starch suspensions in aqueous sucrose solutions are utilized as dilatant fluids in the experiment. Theoretical integral solutions are provided for power law non-Newtonian fluids. Experimental free convection results are also compared with the integral solutions. Dissert. Abstr.

N76-22485 Iowa State Univ. of Science and Technology, Ames.
AUGEMENTATION OF HORIZONTAL IN-TUBE CONDENSATION OF STEAM Ph.D. Thesis
John Henri Royal 1975 383 p
Avail: Univ. Microfilms Order No. 76-9603

The condensation of low pressure steam inside horizontal tubes was investigated in the Iowa State University Heat Transfer Laboratory. Smooth tubes were tested to establish reference conditions and to check existing in-tube condensation heat transfer predictive methods. The in-tube correlations of Akers et al., and Soliman et al., were found to satisfactorily predict these data. Inclined tubes, twisted-tape inserts, and internally-finned tubes were tested as passive techniques to augment in-tube condensation. Tube inclination produced only modest improvements in heat transfer. Twisted tapes with pitch-diameter ratios of 3.8 and 7.0 were tested and found to increase heat transfer coefficients by as much as 30 percent above the empty tube values on a nominal area basis. Four internally-finned tubes were also tested. They produced increases in heat transfer coefficients as much as 150 percent above the smooth tube values on a nominal area basis. Dissert. Abstr.

N76-22486 California Univ., Santa Barbara.
AN EXPERIMENTAL INVESTIGATION OF THE VELOCITY FIELD DUE TO A LINE HEAT SOURCE Ph.D. Thesis
Henry John Nawoj 1975 111 p
Avail: Univ. Microfilms Order No. 76-6575

The velocity field of a laminar natural convection plume above a horizontal line heat source in water was investigated experimentally using laser Doppler anemometry. Vertical velocity profiles in the plume were obtained at varying rates of energy input and at varying distances from the line heat source. The experimental results showed that existing analytical models fail to predict the velocity field in the plume, but do predict accurately the lateral diffusion of vertical velocity if the velocity field is normalized by the plume centerline velocity. The variation of plume centerline velocity with the rate of energy input to the line source was found to be a power law variation with a power of .537 instead of the .4 power predicted by the analytical model. The velocity profiles were found to be similarity profiles. End effects due to the finiteness of the line heat source were determined to be limited to the outer ten per cent of the semispan of the line heat source. Dissert. Abstr.

N76-22487 Texas Univ., Austin.
A NEW FORMULATION FOR COMPUTATIONAL FLUID DYNAMICS Ph.D. Thesis
Donald Brewster Reed 1975 103 p
Avail: Univ. Microfilms Order No. 76-8092

A new set of transport equations is reported for the numerical solution of incompressible fluid dynamics problems. The transport equations are generated by taking the curl of the vorticity transport equation. The major advantage of the eta-velocity formulation is that through-flow problems may be solved without having to assume fully developed flow at the outlet boundary of the computational region. Boundary conditions for the new variables are derived for various flow geometries. The eta-velocity formulation is tested computationally by obtaining finite difference solutions for incompressible flow through the entrance region of a parallel plate channel. Dissert. Abstr.

N76-22488 Michigan Univ., Ann Arbor.
SMALL SCALE STRUCTURE IN THE WALL REGION OF A TURBULENT BOUNDARY LAYER Ph.D. Thesis
Thomas John Bogar 1975 117 p
Avail: Univ. Microfilms Order No. 76-9348

The construction and application is reported of an extremely small hot wire X-probe to the measurement of Reynolds stress in the wall region of the turbulent boundary layer of a flat plate at high Reynolds number. The Wyngaard-Lumley constant temperature anemometer used to heat the wire is analyzed, and a direct acoustical frequency calibration of the wire is made. This calibration shows the small wire to have uniform frequency response to 15 kHz. A novel calibration technique is employed using a high speed, digital minicomputer to determine the velocity in the stream direction and in a direction normal to the wall by matching the unique voltage pairs produced by the X-wire array in a turbulent flow to the voltage pairs produced when the probe is exposed to a known uniform flow inclined at various angles. Dissert. Abstr.

N76-22489*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TABLES OF ISENTROPIC EXPANSIONS OF PARA-HYDROGEN AND RELATED TRANSPORT PROPERTIES FOR TOTAL TEMPERATURES FROM 25 K TO 300 K AND FOR TOTAL PRESSURES FROM 1 ATM TO 10 ATM Interim Report
Richard C. Haut (Old Dominion Univ.) and Jerry B. Adcock Apr. 1976 93 p refs
(NASA-TM-X-72826) Avail: NTIS HC $5.00 CSCL 07D

The isentropic expansions of parahydrogen at various total pressures and total temperatures were numerically determined by iterating Mach number and by using a modified interval halving method. The calculated isentropic values and related properties are presented in tabulated form. Author

N76-22490*# Cornell Univ., Ithaca, N.Y.
NUMERICAL SIMULATION OF SMALL PERTURBATION TRANSONIC FLOWS Final Report, 1 Sep. 1973 - 31 Dec. 1975
A. R. Seebass and N. J. Yu Apr. 1976 42 p refs
(Grant NGR-33-010-057)
(NASA-CR-147155) Avail: NTIS HC $4.00 CSCL 20D

The results of a systematic study of small perturbation transonic flows are presented. Both the flow over thin airfoils and the flow over wedges were investigated. Various numerical schemes were employed in the study. The prime goal of the research was to determine the efficiency of various numerical procedures by accurately evaluating the wave drag, both by computing the pressure integral around the body and by integrating the momentum loss across the shock. Numerical errors involved in the computations that affect the accuracy of drag evaluations were analyzed. The factors that effect numerical stability and the rate of convergence of the iterative schemes were also systematically studied. Author

N76-22491*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANALYSIS OF NITROGEN CONDENSATION IN AN EXPANDING NOZZLE FLOW
F. C. Wang Mar. 1976 27 p refs

(NASA-TM-X-64999) Avail: NTIS HC $4.00 CSCL 20D

Condensation of nitrogen flow in an expanding nozzle flow is analyzed using one-dimensional gas dynamic equations and the equations for nucleation and droplet growth. Effects of variations in the Tolman constant and the mass accommodation factor are discussed as well as the effect of foreign nuclei. Comparisons are made with experimental data obtained from a small, contoured nozzle. Author

N76-22492*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LIQUID JET IMPINGEMENT NORMAL TO A DISK IN ZERO GRAVITY Ph.D. Thesis - Toledo Univ.

Thomas L. Labus Jul. 1976 259 p refs

(NASA-TM-X-73405) Avail: NTIS HC $9.00 CSCL 20D

An experimental and analytical investigation was conducted to determine the free surface shapes of circular liquid jets impinging normal to sharp-edged disks under both normal and zero gravity conditions. An order of magnitude analysis was conducted indicating regions where viscous forces were not significant when computing free surface shapes. The demarcation between the viscous and inviscid region was found to depend upon the flow Reynolds number and the ratio between the jet and disk radius. Author

N76-22493# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).

MASS TRANSFER FROM VIBRATING SINGLE SPHERE AND PACKED BED

Y. Kitaura, H. Tanaka, N. Kojima, and G. Ueda 1976 24 p refs Transl. into ENGLISH from Chem. Eng. (Japan), v. 33, no. 2, 1969 p 175-181

(NRC/CNR-TT-1861) Avail: NTIS HC $3.50

A series of experiments were conducted to determine average mass transfer rates between a steadily flowing gas and particles when the particles and the flowing gas were subjected to vibration. The relationship between the case of a single particle and a packed layer under the same conditions was also investigated. Amplitudes of vibration chosen for the experiments were considerably larger than the particle size, and the vibrations had a wide range of intensities. The particles (camphor balls) were packed in a steel pipe and the gas passed through the packed particles. Boundary layer flow calculations are given and experimental results are summarized. Diagrams of the test setup are included. Author

N76-22494*# Grumman Aerospace Corp., Bethpage, N.Y.

DEVELOPMENT OF A COMPUTER CODE FOR CALCULATING THE STEADY SUPER/HYPERSONIC INVISCID FLOW AROUND REAL CONFIGURATIONS. VOLUME 1: COMPUTATIONAL TECHNIQUE Final Report

Frank Marconi, Manuel Salas, and Larry Yaeger Apr. 1976 101 p refs

(Contract NAS1-11525)

(NASA-CR-2675) Avail: NTIS HC $5.50 CSCL 20D

A numerical procedure has been developed to compute the inviscid super/hypersonic flow field about complex vehicle geometries accurately and efficiently. A second order accurate finite difference scheme is used to integrate the three dimensional Euler equations in regions of continuous flow, while all shock waves are computed as discontinuities via the Rankine Hugoniot jump conditions. Conformal mappings are used to develop a computational grid. The effects of blunt nose entropy layers are computed in detail. Real gas effects for equilibrium air are included using curve fits of Mollier charts. Typical calculated results for shuttle orbiter, hypersonic transport, and supersonic aircraft configurations are included to demonstrate the usefulness of this tool. Author

N76-22495*# Thermo Mechanical Systems Co., Canoga Park, Calif.

NUMERICAL CALCULATION OF THE INTERNAL FLOW FIELD IN A CENTRIFUGAL COMPRESSOR IMPELLER Final Report

Leonard Walitt, James L. Harp, Jr., and C. Y. Liu Dec. 1975 100 p refs

(Contract NAS3-18016)

(NASA-CR-134984; SR-27) Avail: NTIS HC $5.00 CSCL 20D

An iterative numerical method has been developed for the calculation of steady, three-dimensional, viscous, compressible flow fields in centrifugal compressor impellers. The computer code, which embodies the method, solves the steady three dimensional, compressible Navier-Stokes equations in rotating, curvilinear coordinates. The solution takes place on blade-to-blade surfaces of revolution which move from the hub to the shroud during each iteration. Author

N76-22496*# Tuskegee Inst., Ala. School of Mechanical Engineering.

HEAT PIPE RADIATORS FOR SPACE Annual Report

John P. Sellers Jan. 1976 90 p refs

(Contract NAS9-13844)

(NASA-CR-147659; HP-2; AR-3) Avail: NTIS HC $5.00 CSCL 20M

Analysis of the data heat pipe radiator systems tested in both vacuum and ambient environments was continued. The systems included (1) a feasibility VCHP header heat-pipe panel, (2) the same panel reworked to eliminate the VCHP feature and referred to as the feasibility fluid header panel, and (3) an optimized flight-weight fluid header panel termed the 'prototype.' A description of freeze-thaw thermal vacuum tests conducted on the feasibility VCHP was included. In addition, the results of ambient tests made on the feasibility fluid header are presented, including a comparison with analytical results. A thermal model of a fluid header heat pipe radiator was constructed and a computer program written. The program was used to make a comparison of the VCHP and fluid-header concepts for both single and multiple panel applications. The computer program was also employed for a parametric study, including optimum feeder heat pipe spacing, of the prototype fluid header. Author

N76-22497# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

CALIBRATION OF A HIGH TEMPERATURE AND PRESSURE EJECTOR FACILITY WITH BACK PRESSURE EFFECTS Interim Report, 1 Jul. 1973 - 1 Jul. 1974

Brian Quinn and Howard L. Toms Jun. 1975 57 p

(AF Proj. 7116)

(AD-A017546; ARL-75-0226) Avail: NTIS CSCL 21/8

An experiment has been designed to measure directly the effect of the length of a mixing duct on the pumping performance of a high temperature, high pressure ejector. The parameters of most importance to the tests are the mass flows of the primary and entrained air streams. The experiments are designed to measure these parameters by means of a venturi meter and a bellmouth inlet, respectively. The present report describes the calibration of both metering devices against a venturi that had earlier been calibrated by the National Bureau of Standards. Tests were conducted at primary reservoir pressures up to 6.6 atmospheres and temperatures up to 1000 F. Both the primary venturi meter and the bellmouth inlet demonstrated sensitivity to high temperatures, above 500 F, for example. The thermal effects were, however, capable of correlation and suitable coefficients evolved for each device. During the course of the experiments, measurements of the effect of back pressure on performance were made. Increasing back pressure reduced entrainment as predicted by an elementary analysis.

Author (GRA)

N76-22498# Argonne National Lab., Ill.

VIBRATIONS OF A ROW OF CIRCULAR CYLINDERS IN A LIQUID

S. S. Chen Apr. 1975 41 p refs

(Contract W-31-109-eng-38)

(ANL-CT-75-34) Avail: NTIS HC $5.25

The effects of interaction with surrounding liquid on the dynamic behavior of a row of circular cylinders are studied analytically. First, the hydrodynamic forces associated with cylinder motions are obtained using the potential flow theory. Then, a method of solution is presented for free vibration of a row of cylinders. Finally, steady state responses to harmonic excitations are presented. The results of the study have important application in the modeling of cross flow-induced vibration of heat exchanger tubes. Author (NSA)

N76-22499# United Kingdom Atomic Energy Authority, Culham (England).
NUMERICAL SOLUTIONS OF DIRICHLET PROBLEMS WITH AXISYMMETRY BY AN INTEGRAL EQUATION METHOD
P. J. Fielding and M. K. Bevir Mar. 1975 27 p refs
(CLM-R-146) Avail: ERDA Depository Libraries HC $4.50; UK £1.00

Analytic solutions to problems in potential theory can be obtained for only a limited class of boundary geometries and for rather simple types of boundary condition. Finite difference methods allow a much wider class of problems to be solved numerically; however, the treatment of complicated boundary surfaces generally is cumbersome, requiring interpolation and extrapolation of boundary values to the peripheral mesh-points. In addition, the resulting computer programs are large and slow, particularly in the case of exterior problems. A more natural treatment of boundaries is obtained by reformulating such problems in terms of integral equations. One such reformulation is used as the basis of a fast, accurate numerical method for solving three-dimensional axisymmetric Dirichlet problems. The method is particularly suited to applications where the gradient of potential at the boundaries is required. Author (NSA)

N76-22500# Technische Universitaet, Hanover (West Germany). Lehrstuhl und Inst. fuer Verfahrenstechnik.
IMPULSE AND HEAT TRANSPORT IN CONCENTRIC AND EXCENTRIC ANNULAR SLOTS [IMPULS- UND WAERMETRANSPORT IN KON- UND EXZENTRISCHEN RINGSPALTEN]
F. Mayinger and J. Lahrs 1974 13 p refs In GERMAN Presented at the Ann. Meeting of the Ind. Process. Engr., Munich, 17-20 Sep. 1974
Avail: NTIS HC $3.50

The local distribution for an excentric annular slot of a tube heat exchanger was investigated. In addition, the local heat transfer coefficients were determined for the heated inner tube. The flow medium is air, and the wall temperature of the inner tube is kept constant by heating with saturated steam. Flow measurements show that laminar as well as turbulent flow zones occur, which greatly affect the local heat transfer of the inner tube and could lead to material failure. ESA

N76-22501# Aeronautical Research Inst. of Sweden, Stockholm.
REPORT ON THE EUROVISC WORKING PARTY ON TEMPERATURE MEASUREMENTS IN COMPRESSIBLE BOUNDARY LAYERS
Georg Drougge and Gunnar Hovstadius Sep. 1975 18 p refs
(FFA-TN-AE-976) Avail: NTIS HC $3.50

Various techniques for making measurements of boundary layer total temperature profiles are examined. Comparative measurements of different probe designs in different European wind tunnel facilities in Germany, Sweden, the U.S., and England were performed and their results are reported. An investigation on the effects of low Reynolds number on temperature measurements is recommended to obtain information on which temperature probe to use by comparing the result with laser-Doppler-velocity-meter. ESA

N76-22502# Aeronautical Research Inst. of Sweden, Stockholm.
COMPUTATION OF THREE-DIMENSIONAL TURBULENT BOUNDARY LAYERS
Lionel F. East (RAE, Bedford, Engl.) Sep. 1975 86 p refs Presented at the Euromech Conf., Trondheim, Norway, 1975
(FFA-TN-AE-1211) Avail: NTIS HC $5.00

The results of a collaborative effort involving a number of people from several countries for assessing the present state-of-the-art of the prediction of three-dimensional turbulent boundary layers are reported. Three integral and six differential methods were used to calculate and predict the test flow. In addition to the detailed results and brief descriptions of the prediction methods given, tentative conclusions are included, which are based on the internal consistency of the various predictions and, for three of the test flows, on the accuracy with which the measured boundary layer development was predicted. Author (ESA)

N76-22503# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
OPTIMIZATION BASED ON THE BOUNDARY LAYER CONCEPT FOR COMPRESSIBLE DECELERATING FLOWS
Shuang Huo Jun. 1975 64 p refs
(VKI-TN-111) Avail: NTIS HC $4.50

Dissipation-integral boundary layer method is briefly presented which serves as the basis to optimize the shape which will give the minimum loss for given inlet and outlet conditions when designing turbomachinery blades or diffusers. The principles of the optimum deceleration are explained. Following these principles, the optimum boundary layer development is deduced from the boundary layer equation. The corresponding diffuser shape is obtained from a potential method. Two conical diffusers at high inlet Mach numbers were analyzed and the predictions agree satisfactorily with the experiment. From a generalized comparison it is concluded that the straight wall channel diffusers do have a boundary layer development close to the walls to improve their performances. Author (ESA)

N76-22504# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Angewandte Gasdynamik.
INFLUENCE OF NOISE RADIUS AND CONE LENGTH ON HEAT TRANSFER IN THE STAGNATION POINT IN LOW DENSITY FLOW
Faruk Bachour 1976 22 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-04) Avail: NTIS HC $3.50; DFVLR, Cologne DM 10.80

Results of heat transfer measurements on blunt cones are presented. Three conical Teflon models with 5 deg half angle and different nose radii were used in conjunction with two conical bases. An infra-red photography technique was used for temperature measurements. Experimental results show that the nose radius and the cone length have significant influences on the heat transfer at the stagnation point. Author (ESA)

N76-22505# Delft Hydraulics Lab. (Netherlands).
MEASUREMENTS ON THE CAVITATION SUSCEPTIBILITY OF WATER
Daniel Marcus Oldenziel Nov. 1975 14 p refs Presented at the 5th Conf. on Fluid Machinery, Budapest, 15-20 Sep. 1975
(Publ-153) Avail: NTIS HC $3.50

With a lamp-photodiode system it is possible to detect little cavitation bubbles exploding in a small venturi of glass. The pressure in the Venturi throat can be derived from discharge measurements. In practice this system works very simply. By including it in a bypass of a cavitation test-rig, it gives information about the cavitation susceptibility of the water used. In an experimental set-up a resonance tube was included in the Venturi system. In this tube a standing acoustic wave was introduced giving pressure fluctuations which resulted in potential cavitation bubbles with another dynamic behavior. Author (ESA)

N76-22506# North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
STATISTICAL PROPERTIES OF FLUID MOTION AND FLUID FORCE IN A RANDOM WAVE FIELD
K. Pajouhi and C. C. Tung May 1975 100 p refs
(Grant NOAA-04-3-158-40)
(PB-248464/10; Rept-75-1; NOAA-75120111;
Sea-Grant-Repr-80) Avail: NTIS HC $5.00 CSCL 20D

Preliminary studies of the effects of the free surface fluctuations on the statistical properties of wave field kinematics, pressure, and wave force were carried out. It is the purpose of this study to extend the idea developed by Tung to further derive the probability density function, mean, variance, skewness, covariance function, and spectrum of the horizontal components of fluid particle velocity, acceleration, pressure, and wave force. Numerical results are obtained for a mean wind velocity of w = 40 mph, presented graphically, and compared with those obtained previously in which the free surface fluctuation phenomenon was ignored. GRA

N76-22507# Hawaii Inst. of Geophysics, Honolulu.
DIRECTLY MULTIMODED TWO-FLOW LONG SURFACE WAVES
Rudolph W. Preisendorfer May 1975 44 p refs Sponsored by NOAA
(PB-248439/2; HIG-75-12; NOAA-JTRE-131;

NOAA-75120114) Avail: NTIS HC $4.00 CSCL 20D

The purpose of this study is to reduce in a relatively direct fashion the general two-dimensional linear hydrodynamic equations, for long surface waves in a rotating lossy two-port basin, to a set of coupled ordinary differential equations governing the multimode amplitudes of two counter-flowing wave trains between the ports of the basin. A relatively direct and novel reduction is made of the long wave hydrodynamic partial differential equations into sets of coupled ordinary differential equations governing the two-flow components of wave elevation in natural water basins. These basins have two ports, arbitrary coastlines, are rotating as parts of the rotating earth, and exhibit bottom friction. GRA

N76-22508# Colorado Univ., Boulder. Dept. of Mechanical Engineering.

HEAT EXCHANGE IN A FLUID PERCOLATING THROUGH POROUS MEDIA

Adnan H. Nayfeh, D. H. Brownell, Jr., and S. K. Garg 17 Jun. 1975 32 p refs

(Contract NSF AER-74-03429)

(PB-247204/1; CUMER-75-8; NSF/RA/N-75-119) Avail: NTIS HC $4.00 CSCL 20D

A simple system of coupled partial differential equations is derived to describe heat transfer from a fluid percolating through a porous elastic medium. This system retains the integrity of the diffusion and convection processes in both the fluid and the porous solid but allows them to coexist under derived interactions (transfer coefficient). Transient solutions which demonstrate the influence of the microstructure and the fluid speed on the temperature distribution are obtained using an explicit finite difference scheme. Numerical results show that for fluid velocities typical of geothermal systems (Reynolds number much less than 10), the fluid and the solid may be assumed to be in local thermal equilibrium. GRA

N76-23097* Oak Ridge National Lab., Tenn.

SURFACE-TENSION-INDUCED CONVECTION EXPERIMENT MA-041

R. E. Reed *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 11 p ref (For availability see N76-23074 13-88)

CSCL 20D

N76-23105* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SCIENCE DEMONSTRATIONS

R. S. Snyder, K. S. Clifton, B. Facemire, A. F. Whitaker, P. G. Grodska (Lockheed Missiles and Space Co., Sunnyvale, Calif.), and S. Bourgeois (Lockheed Missiles and Space Co., Sunnyvale, Calif.) *In its* Apollo-Soyuz Test Project Feb. 1976 9 p refs (For availability see N76-23074 13-88)

CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N76-22509* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PARTICULATE AND AEROSOL DETECTOR Patent

Jimmie J. Wortman (Res. Triangle Inst., Res. Triangle Park, N. C.), Robert P. Donovan (Res. Triangle Inst., Res. Triangle Park, N. C.), Arthur D. Brooks (Res. Triangle Inst., Res. Triangle Park, N. C.), Larry K. Monteith (Res. Triangle Inst., Res. Triangle Park, N. C.), William H. Kinard, and Robert L. ONeil, inventors (to NASA) Issued 27 Apr. 1976 5 p Filed 26 Apr. 1974 Supersedes N74-22112 (12 - 13, p 1557)

(NASA-Case-LAR-11434-1; US-Patent-3,953,792; US-Patent-Appl-SN-464722; US-Patent-Class-324-61R; US-Patent-Class-209-127R; US-Patent-Class-317-246; US-Patent-Class-324-71CP) Avail: US Patent Office CSCL 14B

A device is described for counting aerosols and sorting them according to either size, mass or energy. The component parts are an accelerator, a capacitor sensor and a readout. The accelerator is a means for accelerating the aerosols toward the face of the capacitor sensor with such force that they partially penetrate the capacitor sensor, momentarily discharging it. The readout device is a means for counting the number of discharges of the capacitor sensor and measuring the amplitudes of these different discharges. The aerosols are accelerated by the accelerator in the direction of the metal layer with such force that they penetrate the metal and damage the oxide layers, thereby allowing the electrical charge on the capacitor to discharge through the damaged region. Each incident aerosol initiates a discharge path through the capacitor in such a fashion as to vaporize the conducting path. Once the discharge action is complete, the low resistance path no longer exists between the two capacitor plates and the capacitor is again able to accept a charge. The active area of the capacitor is reduced in size by the damaged area each time a discharge occurs.

Official Gazette of the U.S. Patent Office

N76-22510*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.

DEVELOPMENT OF A DRIVE SYSTEM FOR A SEQUENTIAL SPACE CAMERA Final Report

James T. Sharpsteen, Curtis D. Solheim, and Louis J. Stoap Mar. 1976 82 p

(Contract NAS9-14573)

(NASA-CR-147535; SPO-30352) Avail: NTIS HC $5.00 CSCL 14E

An electronically commutated dc motor is reported for driving the camera claw and magazine, and a stepper motor is described for driving the shutter with the two motors synchronized electrically. Subsequent tests on the breadboard positively proved the concept, but further development beyond this study should be done. The breadboard testing also established that the electronically commutated motor can control speed over a wide dynamic range, and has a high torque capability for accelerating loads. This performance suggested the possibility of eliminating the clutch from the system while retaining all of the other mechanical features of the DAC, if the requirement for independent shutter speeds and frame rates can be removed. Therefore, as a final step in the study, the breadboard shutter and shutter drive were returned to the original DAC configuration, while retaining the brushless dc motor drive. Author

N76-22511*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

TEST EVALUATION OF THE SPERRY LASER GYRO MODEL ASLG 15 Final Report

Sep. 1975 38 p

(Contract NAS8-30255)

(NASA-CR-144227; R-917) Avail: NTIS HC $4.00 CSCL 14B

Various parameters were evaluated such as bias, scale factor, scale factor sensitivity to supply voltage and external temperature, and turn-on trends. Photographs and descriptions of test equipment are given, and test procedures are outlined. A systems description (electronic equipment, block diagrams), performance characteristics, and equipment specifications of the laser gyro model are given. Also considered are the laser beam optics (laser mode locking). Results are reported for the various parameters examined, and recommendations given. J.R.T.

N76-22512*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PREDICTION OF VIKING LANDER CAMERA IMAGE QUALITY

Friedrich O. Huck, Ernest E. Burcher, Daniel J. Jobson, and Stephen D. Wall Washington Apr. 1976 77 p refs

(NASA-TN-D-8148; L-10626) Avail: NTIS HC $5.00 CSCL 14E

Formulations are presented that permit prediction of image quality as a function of camera performance, surface radiance

properties, and lighting and viewing geometry. Predictions made for a wide range of surface radiance properties reveal that image quality depends strongly on proper camera dynamic range command and on favorable lighting and viewing geometry. Proper camera dynamic range commands depend mostly on the surface albedo that will be encountered. Favorable lighting and viewing geometries depend mostly on lander orientation with respect to the diurnal sun path over the landing site, and tend to be independent of surface albedo and illumination scattering function. Side lighting with low sun elevation angles (10 to 30 deg) is generally favorable for imaging spatial details and slopes, whereas high sun elevation angles are favorable for measuring spectral reflectances. Author

N76-22513# Telecom Australia Research Labs., Melbourne.
A LIGHT OBSCURATION METER
S. J. Charles Jun. 1975 9 p
(Rept-6953) Avail: NTIS HC $3.50

The light obscuration meter described is an instrument in which smoke is produced and its light obscuration measured. It is primarily designed for the testing and calibration of smoke operated fire detectors. Author

N76-22514# Telecom Australia Research Labs., Melbourne.
A TEST INSTRUMENT FOR MEASURING THE RETIMING PERFORMANCE OF PRIMARY LEVEL PCM REGENERATORS
G. J. Semple Mar. 1975 48 p refs
(Rept-6947) Avail: NTIS HC $4.00

A test instrument is reported that is designed to provide an effective method for assessing the retiming operation of primary level PCM regenerators. The nature of timing jitter and the major causes in commercial PCM regenerators are briefly discussed. The significant features of the test instrument are outlined and examples given of its practical application. A detailed circuit description is included and some brief comments made on desirable modifications for a general field version of the instrument. Author

N76-22515# National Aerospace Lab., Amsterdam (Netherlands). Div. Structures and Materials.
THE DEVELOPMENT OF A LASER-GRATING METHOD FOR THE MEASUREMENTS OF STRAIN DISTRIBUTIONS IN PLANE, OPAQUE SURFACES
P. J. Sevenhuijsen and B. Westhuis 21 Mar. 1975 14 p In DUTCH; ENGLISH summary Presented at the Symp. Fotonica, Eindhoven, Neth., 2-4 Apr. 1975
(NLR-MP-75022-U) Avail: NTIS HC $3.50

Glass plate negatives of a grid on a specimen were measured out on an optical bench by means of a thin laser beam. The diffraction phenomenon was used; the diffraction angles were measured by means of opto-electronic devices. The ultimate goal is a relatively fast and accurate method for the measurement of elasto-plastic deformations. Author (ESA)

N76-22516# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
DIELECTRIC SURFACE HOMOGENEITY METER
Kari Siren, Seppo Reinamo, and Martti Tiuri 1975 12 p ref
(Rept-S-74; ISBN-951-750-545-0) Avail: NTIS HC $3.50

An electronic instrument for nondestructive homogeneity measurements of dielectric surfaces is described. It is based on the automatic determination of the resonant frequency of a UHF slot resonator when the resonator is moved along the surface. The variations in the homogeneity change the dielectric constant and hence are shown by variations in the resonant frequency. The dielectric constant sensor is a half wavelength long, flat coaxial line resonator, made of thin metal sheet, flexible enough to be bent around a curved surface. The resonator can be loaded at both ends by symmetric inductive loops to form a bandpass filter. Variations of the resonant frequency of the filter can be measured and give the dielectric constant variations and, hence the variations in density of the dielectric surface layer. The measuring system has been applied to homogeneity testing in the manufacturing of supercalendar rollers for paper mills. Author (ESA)

N76-22517# European Space Agency, Paris (France).
AN APPARATUS FOR MEASUREMENT OF THE SECOND ORDER COHERENCE OF LIGHT
Catherine Friedman Jan. 1976 102 p refs Transl. into ENGLISH of 'App. pour la Mesure de la Coherence du Second Ordre de la Lumiere', ONERA, Paris Report ONERA-NT-227, 1974
(ESA-TT-240; ONERA-NT-227) Avail: NTIS HC $5.50

An instrument was designed for characterizing, in the second order temporal coherence, various electromagnetic radiations in the visible range with low coherence time (of the order of 1 nsec). The operating principle of the apparatus uses a method of intensity correlation by coincidence circuit. It gives the measurement of the normalized second order function of autocorrelation with time of the electric field of the wave. Its adjustment and calibration were performed on a white, thermal radiation of known statistical properties. Its performance was determined by the study of light, corresponding to the green line of the mercury - 200 isotope. The results of these measurements show that the resolution of the apparatus is better than 1 nsec, which shows it to be worthy of consideration in the study of modulated laser light or lights made incoherent by traversing various media. Author (ESA)

N76-22518# National Bureau of Standards, Washington, D.C. Center for Fire Research.
AN INTERFERENCE SIMULATOR FOR QUANTITATIVE DETERMINATION OF THE SUSCEPTIBILITY OF FLAME DETECTORS TO FALSE ALARM Final Report
A. Scheidweiler Nov. 1975 16 p Transl. into ENGLISH of conf. paper from Cerberus Co., Maennedorf, Switzerland Presented at 7th Intern. Seminar on Problems in Automatic Fire Detection, Aachen, 5-6 Mar. 1975; sponsored by Inst. for Elec. Commun. Eng., Aachen, and Gesamthochschule, Duisburg
(PB-247654/7; NBSIR-75-956) Avail: NTIS HC $3.50 CSCL 13L

All fire detectors are susceptible to false alarms, i.e., responding to fire-like conditions when no fire is present. Of all the known fire detectors, flame detectors are probably the most false alarm prone of any of the fire detectors, primarily because these detectors are subjected to more environmental influences resembling the detectors' operating mode more than any other fire detector. This paper describes an investigation into the susceptibility of flame detectors to false alarms. The author describes a test apparatus, constructed and used by his firm, to evaluate the susceptibility of currently-available flame detectors to false alarms. In addition, the apparatus can be used to evaluate prototype flame detectors. GRA

N76-22519# Ballistic Research Labs., Aberdeen Proving Ground, Md.
FILTER DESIGN AND UNFOLDING TECHNIQUES FOR LOW-ENERGY X-RAY SPECTROMETRY Final Report
W. Jeffrey Klemm and John R. Jacobson Sep. 1975 33 p refs Supersedes IMR-257
(DA Proj. 1B0-62118-AD-57)
(AD-A016908; BRL-MR-2529; IMR-257) Avail: NTIS CSCL 07/4

A matrix of filters for use in a passive low-energy spectrometer was designed with the aid of a computer program. The X-ray detecting element of the spectrometer was left unspecified and treated as black box. Another computer code based on matrix inversion was written to unfold energy spectra. This report discusses both codes in detail and presents an example using simulated measurements. Error analysis confirmed the utility of the approach for low-resolution spectrometry. GRA

N76-22520# Environmental Monitoring and Support Lab., Research Triangle Park, N.C. Environmental Monitoring Branch.
HYDROCARBON MEASUREMENT DISCREPANCES AMONG VARIOUS ANALYZERS USING FLAME-IONIZATION DETECTORS Final Report
Frank F. McElroy and Vinson L. Thompson Sep. 1975 34 p
(PB-247821/2; EPA-600/4-75-010) Avail: NTIS HC $4.00 CSCL 14B

Several experimenters have observed substantially discrepant nonmethane hydrocarbon measurements from various types of hydrocarbon analyzers measuring identical samples of ambient

air. A number of flame-ionization analyzers was observed under controlled conditions while making simultaneous measurements of urban ambient air. Substantial discrepancies were found to occur among different models of analyzers. The standard deviations of these discrepancies averaged 0.322 part per million, which is extremely large with respect to the ambient air quality standard (guide) for nonmethane hydrocarbons, 0.24 part per million.GRA

N76-22521# Entropy Environmentalists, Inc., Research Triangle Park, N.C.
COLLECTION EFFICIENCY STUDY OF THE PROPOSED METHOD 13 SAMPLING TRAIN Final Environmental Protection Technology Series
Walter Smith Sep. 1975 29 p refs
(Contract EPA-68-02-1792)
(PB-248103/4; EPA-600/2-75-052) Avail: NTIS HC $4.00 CSCL 14B

Testing undertaken to determine the collection efficiency of the proposed Method 13 sampling train is summarized. The efficiency of the train in the concentration range 6-118 ppm and at a sampling rate of 3/4 to 1 cfm was found to be 99 + percent. Laboratory analyses of samples using the SPADNS and the SIE techniques for fluoride determination showed that the SPADNS method is less precise and accurate than the specific ion electrode. It was also determined that the distillation step in the analytical procedure resulted in erratic and nonreproducible results. Analyses requiring this distillation step must be watched carefully to avoid carry over of potential interfering ions. GRA

N76-22522# Illinois State Dept. of Transportation, Springfield. Bureau of Materials and Physical Research.
MODIFICATION OF THE BPR-TYPE ROADOMETER
J. E. LaCroix and E. J. Kubiak Jun. 1975 40 p
(PB-248627/2; Phys-Res-63; FHWA-RD-76-S0427) Avail: NTIS HC $4.00 CSCL 14B

Modifications were made in the horizontal distance and vertical displacement sensing devices of a BPR-Type Roadometer to improve the capabilities of this device for measuring pavement segments as short as 100 feet in length, and to increase the operating speed. Test results show that the modified system can be operated at test speeds ranging to 50 mph, and strongly suggest that the limiting speed may be in excess of 60 mph. Preliminary tests indicate that the device is capable of measuring pavement segments as short as 100 feet with sufficient accuracy to obtain RI values that are meaningful and usable. Roughness measurements obtained at 30, 40, and 50 mph correlated very well with those obtained at 20 mph. GRA

N76-22523# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
A GAGE BLOCK MEASUREMENT PROCESS USING SINGLE WAVELENGTH INTERFEROMETRY
John S. Beers Dec. 1975 37 p refs
(PB-247944/2; NBS-MN-152; LC-75-619353) Avail: NTIS HC $4.00 CSCL 14B

The interferometric transfer of the length unit from its defined wavelength to NBS reference standard gage blocks is basic to the gage block calibration program at NBS. The interferometric measurement process using a laser light source and a Kosters type gage block interferometer is described. Continuous evaluation and refinement of the process is aided by statistical treatment and control chart techniques. All error sources, both random and systematic, are evaluated and the process is maintained in a state of statistical control. GRA

N76-22524# Army Electronics Command, Fort Monmouth, N.J.
A HIGH PRECISION LASER ASSISTED X-RAY GONIOMETER FOR CIRCULAR PLATES
J. R. Vig Dec. 1975 30 p refs
(DA Proj. 1S7-62705-AH-94F)
(AD-A018520; ECOM-4376) Avail: NTIS CSCL 14/2

An X-ray goniometer system capable of high accuracy measurements on thin circular crystal plates is described. The errors in previous systems have been due primarily to the fact that, whereas one wishes to measure the angle between the atomic plane and the plate face, goniometers in general measure the angle between the atomic plane and a plane defined by the goniometer which is not necessarily parallel to the plate face. The system described corrects for the inaccuracies associated with the goniometer by means of a laser alignment system. The X-ray beam and a laser beam are reflected from the same point on the plate. The reflected laser beam is monitored with position sensing photodetectors which can detect the position of the plate face with accuracies better than 0.5 seconds of arc. The accuracy of measurements is thus limited primarily by the accuracy with which the peak of the X-ray rocking curve can be determined. A prototype of the measurement system has been assembled from commercially available components. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N76-22525 California Univ., Irvine.
PULSE PROPAGATION IN A PARTIALLY HOMOGENEOUSLY BROADENED GAS LASER AMPLIFIER, DETERMINATION OF LINE-SHAPE PARAMETERS Ph.D. Thesis
Heihachi Sato 1975 140 p
Avail: Univ. Microfilms Order No. 76-7237

The line-shape parameters of a laser medium are important for designing a laser amplifier and oscillator for various applications. Experimental methods for line-shape parameter analysis of a CW partially homogeneously broadened gas laser based on line-narrowing of amplified spontaneous emission and saturated gain measurements have been successfully applied to a 3.5 microns high-gain xenon transition. These methods, however, cannot be applied to high-gain ultraviolet gas lasers using H2 and Xe2 etc., and high-gain metal vapor lasers using Pb, Cu and others, because these-lasers can operate only in pulsed modes. Therefore, a new method for determining the line-shape parameters such as the Lorentzian line width, Doppler line width, and the gain parameter, of a partially homogeneously broadened, linear laser amplifier is developed. Dissert. Abstr.

N76-22526 California Univ., San Diego.
TWO-STEP INFRARED LASER PUMPING AND UPWARD FREQUENCY CONVERSION IN GASEOUS MEDIA Ph.D. Thesis
James Henry Morris 1975 172 p
Avail: Univ. Microfilms Order No. 76-7816

A theory is developed describing a means of rapidly pumping a rotational sub-level lying within the second state of an absorbing vibrational mode of a polyatomic gas by a short, intense infrared laser pulse of relatively narrow spectral width. A simple model of the absorbing mode of the gas molecule consists of a ground, a first, and a second vibrational level. Within each of these levels lie individual rotational sub-levels which play the active role in the absorption of the sub-microsecond, quasi-monochromatic pulse. The most important finding is that by using pump radiation of the proper frequency, these two sub-levels in the first vibrational state can be made to coincide; that is forced into being the same sub-level. When this is the cause, pumping of the sub-level in the second vibrational state can proceed without a bottleneck. The rate of influx of molecules to this sub-level will then be found to be of the same order of magnitude as the rate of the pumping radiation. Several applications of this bottleneck eliminated pumping process are presented. Dissert. Abstr.

N76-22527*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
REMOTE MEASUREMENT UTILIZING NASA'S SCANNING LASER DOPPLER SYSTEMS. VOLUME 1. LASER DOPPLER WAKE VORTEX TRACKING AT KENNEDY AIRPORT Final Report
M. C. Krause, D. J. Wilson, R. E. Howle, B. B. Edwards, C. E. Craven, and J. L. Jetton Mar. 1976 103 p
(Contract NAS8-30971)
(NASA-CR-144267; LMSC-HREC-TR-D496633-Vol-1) Avail: NTIS HC $5.50 CSCL 20E

Test operations of the Scanning Laser Doppler System (SLDS) at Kennedy International Airport (KIA) during August 1974 through June 1975 are reported. A total of 1,619 data runs was recorded

with a totally operational system during normal landing operations at KIA. In addition, 53 data runs were made during cooperative flybys with the C880 for a grand total of 1672 recorded vortex tracks. Test crews were in attendance at KIA for 31 weeks, of which 25 weeks were considered operational and the other six were packing, unpacking, setup and check out. Although average activity equates to 67 recorded landing operations per week, two periods of complete runway inactivity spanned 20 days and 13 days, respectively. The operation frequency therefore averaged about 88 operations per week. Author

N76-22528*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.

REMOTE MEASUREMENT UTILIZING NASA'S SCANNING LASER DOPPLER SYSTEMS. VOLUME 2: LASER DOPPLER DUST DEVIL VELOCITY PROFILE MEASUREMENT PROGRAM Final Report

R. E. Howle, M. C. Krause, C. E. Craven, E. J. Gorzynski, and B. B. Edwards Mar. 1976 77 p

(Contract NAS8-30971)

(NASA-CR-144268; LMSC-HREC-TR-D496754-Vol-2) Avail: NTIS HC $5.00 CSCL 20E

The first detailed velocity profile data on thermally induced dust vortices are presented. These dust devils will be analyzed and studied to determine their flow fields and origin in an effort to correlate this phenomena with the generation and characteristics of tornadoes. A continuing effort to increase mankind's knowledge of vortex and other meteorological phenomena will hopefully allow the prediction of tornado occurrence, their path, and perhaps eventually even lead to some technique for their destruction. Author

N76-22529*# Arkansas Univ., Little Rock.

DIRECTIONAL ACOUSTIC MEASUREMENTS BY LASER DOPPLER VELOCIMETERS

M. K. Mazumder, R. L. Overbey, and M. K. Testerman May 1976 13 p refs

(Grant NGL-04-001-007)

(NASA-CR-147144) Avail: NTIS HC $3.50 CSCL 20E

Laser Doppler velocimeters (LDVs) were used as velocity microphones to measure sound pressure level in the range of 90-130 db, spectral components, and two-point cross correlation functions for acoustic noise source identification. Close agreement between LDV and microphone data is observed. It was concluded that directional sensitivity and the ability to measure remotely make LDVs useful tools for acoustic measurement where placement of any physical probe is difficult or undesirable, as in the diagnosis of jet aircraft noise. Author

N76-22530*# Illinois Univ., Urbana. Gaseous Electronics Lab.

STUDIES OF BASIC MECHANISMS IN HIGH PRESSURE GASES: APPLICATIONS TO HIGH EFFICIENCY HIGH POWER LASERS Semiannual Progress Report, 1 Nov. 1975 - 1 May 1976

J. T. Verdeyen, B. E. Cherrington, S. G. Leslie, W. S. Millar, and B. E. Edwards 1 May 1976 23 p refs

(Grant NGR-14-005-200)

(NASA-CR-147101) Avail: NTIS HC $3.50 CSCL 20E

A high power pulsed dye laser was used to optically excite high pressure cesium-xenon mixtures and the resulting measurements are presented. A microwave discharge in rubidium at relatively high xenon pressure was achieved. Preliminary studies of cadium-rare gas mixtures are discussed and a detailed description of the entire experimental apparatus is given. L.S.

N76-22531*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GODDARD LASER SYSTEMS AND THEIR ACCURACIES

F. O. VonBun Feb. 1976 20 p refs

(NASA-TM-X-71095; X-900-76-28) Avail: NTIS HC $3.50 CSCL 20E

The latest Goddard laser systems, and their use in the Earth Dynamic Program are described. The tracking accuracies obtained using actual field data are discussed. Author

N76-22532# California Univ., Livermore. Lawrence Livermore Lab.

THERMO-OPTICAL LIMITATIONS ON HIGH AVERAGE POWER DYE LASERS

O. G. Peterson, A. A. Pease, and W. M. Pearson 14 May 1975 20 p Presented at the IEEE Optical Soc. of Am. Conf. on Laser Eng. and Appl., Washington, D. C., 28 May 1975 Sponsored by ERDA

(UCRL-76355; Conf-750520-5) Avail: NTIS HC $4.00

The effects of thermally-induced prism-inhomogeneities in dye laser windows are discussed. A few potential solutions to the problem are presented. NSA

N76-22533# California Univ., Livermore. Lawrence Livermore Lab.

MEASUREMENT OF LASER FUSION CAPSULES USING THE INTERFEROMETER METHOD OF EXCESS FRACTIONS

R. R. Stone 7 Apr. 1975 17 p refs

(Contract W-7405-eng-48)

(UCRL-51788) Avail: NTIS HC $4.00

A system is proposed to allow use of the method of excess fractions with a high-power interference microscope. This allows the measurement of average wall thicknesses for small (less than 200-mu m o.d., and from 0.5- to 2.0- micron wall thicknesses) transparent laser fusion targets to better than 0.5 percent and wall uniformity to better than 0.3 percent. The DT gas fill of the capsules can be nondestructively measured to about + or - 3 percent. Author (NSA)

N76-22534# European Space Agency, Paris (France).

MEASURING INSTRUMENT FOR THE DETERMINATION OF OUTPUT WAVE LENGTH AND ENERGY FROM PULSED LASERS

Hartmut Herrmann Feb. 1976 33 p refs Transl. into ENGLISH of 'Messgeraet zur Bestimmung der Ausgangswellenlaenge u. Energie von Pulslasern', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-Mitt-75-15, 4 Aug. 1975 Original German report available from DFVLR, Cologne 14.10 DM

(ESA-TT-257; DLR-Mitt-75-15) Avail: NTIS HC $4.00

A measuring instrument for determination of wavelength and energy of a ruby laser for a Lidar system is described. The operating principle is based on the measurement of pulse energy behind a transmission element that is dependent on wavelength the measuring energy then being related to a reformer energy in front of the transmission element. The element consists of a narrowband filter with half width of a 0.9 angstrom. First results are discussed. ESA

N76-22535# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

PARAMETRIC STUDY OF AMPLIFICATION IN CARBON DIOXIDE LASERS Ph.D Thesis - Paris Univ.

Jean Bonnet 1975 46 p refs In FRENCH; ENGLISH summary Report will also be announced as translation

(ONERA-1975-4) Avail: NTIS HC $4.00

A theoretical model for predicting the performance of an electric carbon dioxide laser and checking the model accuracy is presented. The small signal gain of a pulse mode amplifier is calculated with that model and compared with the result of measurements performed on an electron beam amplifier for ten different mixture ratios of CO2, N2, He, and various excitation conditions. The agreement obtained between prediction and measurements permits one to assert the validity of the model, with however a restriction for the case of pure CO2. The choice of coefficients of exchange between CO2 vibrational modes slightly different from those adopted in the paper, and a detailed study of the discharge would lead to an increased precision of the model. Author (ESA)

N76-22536# European Space Agency, Paris (France).

FLOW WITH VIBRATIONAL ENERGY EXCHANGE APPLICATION TO CO2 ELECTRIC LASERS

Claude Dahan Jan. 1976 102 p refs Transl. into ENGLISH of 'Ecoulement avec Echange d'Energie Vibrationnelle et Appl. au Laser Elec. a CO2', ONERA, Paris Report ONERA-NT-216, 1974

(ESA-TT-237; ONERA-NT-216) Avail: NTIS HC $5.50

The performance of a continuous wave (CO2,N2,He) laser ionized by an electron beam was calculated. Several types of

phenomena are considered: energy exchange processes between molecules of laser medium, electron molecular excitation processes, and aerodynamic phenomena: the energy exchanges accompanying the laser effect generate important quantities of heat, which have to be evacuated by the flow. After a survey of the fundamental assumptions on molecular phenomena, a computer code was developed for following, along the flow, the evolution of the thermodynamic parameters (pressure, temperature), of the laser gain, and of the electrical properties (electron density and temperature). To provide a finer description of the latter, a model was established, giving the energy distribution of the electrons in the laser medium. Two possible limitations are emphasized: at subsonic regimes in the nozzle, an electric breakdown occurs when the ratio of electric field to neutral particle density rises too much; at supersonic regimes, a sonic blockage arises. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N76-22537 California Univ., Irvine.
LINEAR MULTIVARIABLE SERVOMECHANISMS Ph.D. Thesis
Charles Allan Wolfe 1975 73 p
Avail: Univ. Microfilms Order No. 76-7238

Linear multivariable servomechanisms were studied to extend the single-input/single-output concept of system type to the multivariable (multi-input/multi-output) case. For the multivariable system, system type is given as a vector of numbers which represent the type of the individual input/output pairs. New methods are presented for determining the type of a multivariable transfer function both from the frequency domain and from the time domain descriptions of the system. The problem of designing compensators to create a transfer function of a specified type is considered. This problem is complicated by the fact that rational function matrices by which both the transfer function and the compensator are represented, do not commute. The difficulty is that the type of a transfer function is defined by a left divisor while the most common compensator configuration leads to a compensator transfer function matrix on the right of the original system transfer function matrix. Dissert. Abstr.

N76-22538 Cincinnati Univ., Ohio.
A THEORETICAL AND EXPERIMENTAL ANALYSIS OF THE EQUILIBRIUM SINKING OF AXIALLY-SYMMETRIC CAVITIES BY ELECTROCHEMICAL MACHINING Ph.D. Thesis
Shi-tong Lin 1975 146 p
Avail: Univ. Microfilms Order No. 76-8301

The problem of deep hole sinking by electrochemical machining is investigated both analytically and experimentally. The analysis consists of a one dimensional fluid mechanics approach insofar as the transport phenomena in the electrolyte are concerned. The kinematics of the process includes an accounting of the relative motion of the electrodes. These two models are then synthesized and a numerical scheme developed for integrating the system of resulting equations to produce five basic ECM variables (void fraction, electrolyte temperature - pressure - velocity, electrode gap). Experiments were conducted using aluminum anodes and NaNO3 electrolyte solution in a 3000 ampere. Comparison of the analytical model with the experimental data shows that the model is accurate enough so that both void fraction and temperature corrections to the constant conductivity model are justified. Dissert. Abstr.

N76-22539 Missouri Univ., Columbia.
DESIGN OF AN AUTOMATED INTERNAL COMBUSTION ENGINE-TESTING SYSTEM BASED ON DYNAMIC DISCRETE-TIME, STATE-VARIABLE FEEDBACK CONTROL Ph.D. Thesis
Walter Joseph Rychlewski, III 1975 705 p
Avail: Univ. Microfilms Order No. 76-7546

The development of a transient control strategy is reported which guarantees repeatable dynamic duplication, in the laboratory, of engine speed and torque developed by a vehicle on the road. Important features, such as the flexibility to modify control strategies, the adaptability to handle a variety of engines, the universality to be applicable in various existing laboratories, automated reporting, error reduction, modular design, economic practicality, and other similar features were established as system design goals in order to distinguish the Laboratory Internal Combustion Engine Testing System (LICETS) as a comprehensive automated testing system. Dissert. Abstr.

N76-22540* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEPLOYABLE FLEXIBLE TUNNEL Patent
Newton D. Brown (Goodyear Aerospace Corp., Akron, Ohio), Gordon L. Jeppesen (Goodyear Aerospace Corp., Akron, Ohio), and Nicholas C. Costakos, inventors (to NASA) (Goodyear Aerospace Corp., Akron, Ohio) Issued 27 Apr. 1976 5 p Filed 27 Dec. 1974 Supersedes N75-14818 (13 - 06, p 0630) Sponsored by NASA
(NASA-Case-MFS-22636-1; US-Patent-3,952,976; US-Patent-Appl-SN-536762; US-Patent-Class-244-158; US-Patent-Class-114-16.6; US-Patent-Class-244-137P; US-Patent-Class-244-161) Avail: US Patent Office CSCL 13E

A pressurized flexible tunnel which employs a plurality of equal length cables between ends of the tunnel is described. The cables are lengthened or shortened together by a single winch to adjustably constrain elongation. By positioning one set of cables on one side of the tunnel, the tunnel may be expanded or contracted along a straight line or along a curve as permitted by externally positioned orienting means.
Official Gazette of the U.S. Patent Office

N76-22541* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLUID SEAL FOR ROTATING SHAFTS Patent
Lawrence P. Ludwig, inventor (to NASA) Issued 27 Apr. 1976 6 p Filed 19 Feb. 1975 Supersedes N75-18576 (13 - 10, p 1113)
(NASA-Case-LEW-11676-1; US-Patent-3,953,038; US-Patent-Appl-SN-551184; US-Patent-Class-277-93R; US-Patent-Class-277-4; US-Patent-Class-277-41; US-Patent-Class-277-74) Avail: US Patent Office CSCL 11A

An improved fluid seal for a rotating shaft is provided which includes an inner annular ring or runner adapted to be secured to the rotating shaft and a composite sealing ring which is keyed to the inner ring and includes a radial sealing surface. An outer, nonrotating, annular ring or housing which is concentrically disposed with respect to the runner and sealing ring, includes a radial sealing surface which engages the sealing surface of the sealing ring. A circular wave spring is anchored to the housing and is disposed between the composite sealing ring and a snap ring secured to the housing; an axial force is provided which forces the two sealing surfaces into sealing contact. The waves of the spring act as individual hydrodynamic bearings, and the axial force is transmitted across an oil film. This eliminates rubbing contact and the need for a separate thrust bearing.
Official Gazette of the U.S. Patent Office

N76-22542# Royal Aircraft Establishment, Farnborough (England).
METHODS OF DYNAMIC MEASUREMENTS IN TURBOMACHINES
R. Larguier and A. DeSievers Jan. 1976 26 p refs Transl. into ENGLISH from L'Aeronautique et L'Astronautique (France), v. 46, 1974 p 9-18; ONERA-TP-1403-(1974)
(RAE-Lib-Trans-1835; BR51462; ONERA-TP-1403-(1974)) Avail: NTIS HC $4.00

The work at ONERA on dynamic measurements in turbomachines, which extends from incompressible to supersonic flow is reported. Data on surface pressures on moving blades and on the external casing, opposite the rotor, and on determination of the wake by pressure sensor and hot wire are presented. Author

N76-22543# Royal Aircraft Establishment, Farnborough (England).
DETERMINATION OF THE TIME-AVERAGED PRESSURES IN STRONGLY FLUCTUATING FLOWS AND ESPECIALLY

IN TURBO-MACHINES
H. Weyer Jan. 1976 145 p refs Transl. into ENGLISH from Deutsche Luft- und Raumfahrt report DLR-FB-74-34
(RAE-Lib-Trans-1850; DLR-FB-74-34) Avail: NTIS HC $6.00

The problems of measuring pressure are studied for strongly fluctuating flow - for example, in turbomachines - with particular regard to the determination of clearly defined average pressures. A detailed description is given of the operating principles of three new procedures for determining the actual time averages of pressure fluctuations of high frequency and amplitude and also of the construction of the corresponding measuring devices. Laboratory testing of these procedures is reported using a newly developed calibration device that generates defined pressure fluctuations, and initial tests of the measuring devices in turbocompressors are described. Author

N76-22544*# Rensselaer Polytechnic Inst., Troy, N.Y. Tribology Lab.
THE DESIGN OF AIRCRAFT BRAKE SYSTEMS, EMPLOYING COOLING TO INCREASE BRAKE LIFE
R. P. Scaringe, Ting-Long Ho, and Marshall B. Peterson Oct. 1975 52 p refs
(Grant NGR-33-018-152)
(NASA-CR-134980) Avail: NTIS HC $4.50 CSCL 13L

A research program was initiated to determine the feasibility of using cooling to increase brake life. An air cooling scheme was proposed, constructed and tested with various designs. Straight and curved slotting of the friction material was tested. A water cooling technique, similar to the air cooling procedure, was evaluated on a curved slotted rotor. Also investigated was the possibility of using a phase-change material within the rotor to absorb heat during braking. Various phase-changing materials were tabulated and a 50%, (by weight) LiF - BeF2 mixing was chosen. It was shown that corrosion was not a problem with this mixture. A preliminary design was evaluated on an actual brake. Results showed that significant improvements in lowering the surface temperature of the brake occurred when air or water cooling was used in conjunction with curved slotted rotors.
Author

N76-22545*# Battelle Columbus Labs., Ohio.
EVALUATION OF SELECTED CHEMICAL PROCESSES FOR PRODUCTION OF LOW-COST SILICON Quarterly Progress Report, 15 Dec. 1975 - 31 Mar. 1976
J. M. Blocher, Jr., M. F. Browning, W. J. Wilson, and D. C. Carmichael 8 Apr. 1976 100 p refs Prepared for JPL
(Contracts NAS7-100; JPL-954339)
(NASA-CR-146900; QPR-2) Avail: NTIS HC $5.00 CSCL 13H

Plant construction costs and manufacturing costs were estimmated for the production of solar-grade silicon by the reduction of silicon tetrachloride in a fluidized bed of seed particles, and several modifications of the iodide process using either thermal decomposition on heated filaments (rods) or hydrogen reduction in a fluidized bed of seed particles. Energy consumption data for the zinc reduction process and each of the iodide process options are given and all appear to be acceptable from the standpoint of energy pay back. Information is presented on the experimental zinc reduction of SiCl4 and electrolytic recovery of zinc from ZnCl2. All of the experimental work performed thus far has supported the initial assumption as to technical feasibility of producing semiconductor silicon by the zinc reduction or iodide processes proposed. The results of a more thorough thermodynamic evaluation of the iodination of silicon oxide/carbon mixtures are presented which explain apparent inconsistencies in an earlier cursory examination of the system. Author

N76-22546*# Honeywell Corporate Research Center, Bloomington, Minn.
DIP COATING PROCESS: SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE-AREA SILICON SHEET TASK OF THE LOW-COST SILICON SOLAR ARRAY PROJECT Quarterly Report, 21 Oct. - 18 Dec. 1975
J. D. Heaps, R. B. Maciolek, W. B. Harrison, and H. A. Wolner 19 Dec. 1975 25 p Prepared for JPL
(Contracts JPL-954356; NAS7-100)
(NASA-CR-146877; QR-1) Avail: NTIS HC $3.50 CSCL 13H

The research program to investigate the technical and economic feasibility of producing solar-cell-quality sheet silicon by dip-coating one surface of carbonized ceramic substrates with a thin layer of large-grain polycrystalline silicon is reported. The initial effort concentrated on the design and construction of the experimental dip-coating facility. The design was completed and its experimental features are discussed. Current status of the program is reported, including progress toward solar cell junction diffusion and miscellaneous ceramic substrate procurement. Author

N76-22547*# Honeywell Corporate Research Center, Bloomington, Minn.
DIP COATING PROCESS: SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE-AREA SILICON SHEET TASK OF THE LOW-COST SILICON SOLAR ARRAY PROJECT Quarterly Report, 19 Dec. 1975 - 18 Mar. 1976
J. D. Heaps, R. B. Maciolek, W. B. Harrison, H. A. Wolner, G. Hendrickson, and L. D. Nelson 22 Mar. 1976 30 p Prepared for JPL
(Contracts NAS7-100; JPL-954356)
(NASA-CR-146874; QR-2) Avail: NTIS HC $4.00 CSCL 13H

To date, an experimental dip-coating facility was constructed. Using this facility, relatively thin (1 mm) mullite and alumina substrates were successfully dip-coated with 2.5 - 3.0 ohm-cm, p-type silicon with areas of approximately 20 sq cm. The thickness and grain size of these coatings are influenced by the temperature of the melt and the rate at which the substrate is pulled from the melt. One mullite substrate had dendrite-like crystallites of the order of 1 mm wide and 1 to 2 cm long. Their axes were aligned along the direction of pulling. A large variety of substrate materials were purchased or developed enabling the program to commence a substrate definition evaluation. Due to the insulating nature of the substrate, the bottom layer of the p-n junction may have to be made via the top surface. The feasibility of accomplishing this was demonstrated using single crystal wafers. Author

N76-22548# Division of Mechanical Engineering, Ottawa (Ontario).
THE ROTATING STATOR CONCEPT, EXPERIMENTAL PERFORMANCE CHARACTERISTICS COMPARED WITH THE CONVENTIONAL COMPRESSOR
M. S. Chappell, D. A. J. Millar (Carleton Univ.), and A. A. Swiderski Jul. 1975 66 p refs
(ME-242) Avail: NTIS HC $4.50

The Fanstat concept of compressor spooling involves the co-rotation of both rotor and stator rows of a compressor in the core engine, with the fan being mounted on, and driven by, the rotating stator case. The primary function of the Fanstat is to provide an aerodynamic gearbox that will permit the fan and the fan turbine to run close to their individual optimum speeds. The current report describes a detailed calibration of a conventional compressor and presents the performance characteristics of the co-rotating compressor configuration. The test results confirmed aerodynamic feasibility of the Fanstat arrangement of compressor spooling, and major performance parameters were not significantly different from the conventional compressor in the useful operating range. In general, the performance characteristics of the experimental Fanstat compressor substantiated the predictions of the hybrid computer model and thus confirmed the latter as a useful and powerful tool for investigating the behavior of this novel compressor arrangement. Author

N76-22549# Committee on Interior and Insular Affairs (U. S. Senate).
AUTOMOTIVE RESEARCH AND DEVELOPMENT
Washington GPO 1975 108 p refs Hearing before Subcomm. on Energy Res. and Water Resources of Comm. on Interior and Insular Affairs, 94th Congr., 1st Sess., 5 May 1975
(GPO-56-712) Avail: Subcomm. on Energy Res. and Water Resources

Programs are discussed which can meet the national energy and automobile fuel economy goals, commensurate with clean air and economic growth objectives, and that are based on market-oriented alternatives. Author

N76-22550*# Varian Associates, Lexington, Mass. Vacuum Div.

SLICING OF SILICON INTO SHEET MATERIAL: SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SILICON-SOLAR ARRAY PROJECT Quarterly Report, 9 Jan. - 21 Mar. 1976

S. C. Holden 29 Mar. 1976 28 p ref Prepared for JPL (Contracts NAS7-100; JPL-954374)
(NASA-CR-147209; ERDA/JPL-954374-76/1; QR-1) Avail: NTIS HC $4.00 CSCL 13H

In order to achieve the broad program goal of low cost slicing of silicon into solar cell wafers, the process must first be clearly understood and then techniques developed to allow more controllability and higher productivity. The cutting rate of slurry sawing is related to load, kerf area, work material hardness and reciprocation speed. An explanation for the high efficiency of slurry sawing is offered in terms of binding forces on abrasive particles and the abrasive wear of brittle materials. Results of five cutting tests are given in which kerf length is 3.88 inches and .984 inch, and cutting loads are varied from two ounces to eight ounces per blade. Reduction of cutting rate to the normalized cutting efficiency shows the accuracy of the theory. The efficiency ranged from 1.13 to .86. The lower efficiencies occured at high loads and short kerf length. Thickness measurements show a decrease in wafer accuracy with increasing cutting load and speed. Author

N76-22551# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.

PHENOMENOLOGICAL INVESTIGATION OF THE RESONANCE EFFECTS ON THE TORSIONAL VIBRATION MODE OF A CABLE BOOM Final Report

D. Wyn-Roberts and I. McVicar Dec. 1972 141 p refs (Contract ESTEC-1551/71-AA)
(ESS/SS-415; ESA-CR(P)-230) Avail: NTIS HC $6.00

The purpose of the investigation was to examine the behavior of a variety of cable booms under the influence of mechanical and thermal excitation, for application to the GEOS satellite as supports for equipment sensors. The behavior of the cable under various conditions was investigated. Resonance modes were clearly identified with large amplitude magnification occurring for both torsion and lateral resonance conditions. Oscillating heating alone did not cause any movements of the cable even when induced in resonant frequencies. Reducing the tip inertia of the cable caused an expected increase in torsion resonance frequencies. A number of cases were highlighted where cross-coupling between lateral and torsion modes occurred. A discussion of the relevance of these results to an orbiting satellite with cable booms concludes that such booms will require dampers in order to inhibit the large amplitude magnification. The present rig is suitable for investigating such damping schemes and the recommendation is made that such an investigation should be urgently instigated. Author (ESA)

N76-22552# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service Environnement et Metrologie.

SUSPENSION FOR MISSILE EQUIPMENT: MEASUREMENT OF THE DYNAMIC CHARACTERISTICS OF VISCOELASTIC MATERIALS UTILIZABLE AS DAMPERS [SUSPENSION DES EQUIPEMENTS DE MISSILES. MESURE DES CARACTERISTIQUES DYNAMIQUES DES MATERIAUX VISCOELASTIQUES UTILISABLES COMME AMORTISSEURS]

J. Moriceau 12 Jun. 1975 90 p refs In FRENCH
(LRBA-E-1-300-PV-1/SEM) Avail: NTIS HC $5.00

Tests were carried out to determine the dynamic stiffness and damping of some viscoelastic materials, in order to develop a catalog of viscoelastic materials to be used in shock or vibration damping systems including not only their chemical and mechanical properties but also their dynamic characteristics as function of some parameters. The principles of the method for the measurement of dynamic characteristics are presented and results discussed. The influence of temperature and specimen geometry is evidenced. The use of polyurethane elastomers in damping systems, over rubber and polyester foams, is emphasized. ESA

N76-22553# Societe d'Applications Generales d'Electricite et de Mecanique, Paris (France).

DEVELOPMENT OF A HIGH RESOLUTION STEPPER MOTOR PROTOTYPE. VOLUME 1: GENERAL PRESENTATION Final Report

Dec. 1975 28 p 3 Vol.
(SA-7701-Vol-1; ESA-CR(P)-789-Vol-1) Avail: NTIS HC $4.00

This motor could be used to drive large solar panels of future satellites. Its main performance characteristics are as follows: 1,200 steps per revolution, relaxation torque greater than 0.3 mN, holding torque greater than 1mN, and input power at full torque less than 1.5 W. For volume 2 and 3; see ESR- 97067. ESA

N76-22554# Societe d'Applications Generales d'Electricite et de Mecanique, Paris (France).

DEVELOPMENT OF A HIGH RESOLUTION STEPPER MOTOR PROTOTYPE. VOLUME 2: DETAILED RESULTS. VOLUME 3: DEVELOPMENT Final Report [RAPPORT FINAL RELATIF A UN PROTOTYPE DE MOTEUR PAS A PAS A GRANDE RESOLUTION. VOLUME 2: RESULTATS DETAILLES. VOLUME 3: DEVELOPPEMENT]

Dec. 1975 56 p refs In FRENCH 3 Vol.
(SA-7702-Vol-2; SA-7703-Vol-3; ESA-CR(P)-789-Vol-2; ESA-CR(P)-789-Vol-3) Avail: NTIS HC $4.50

This motor could be used to drive large solar panels of future satellites. Results of investigations concerning a breadboard model without a relaxation torque and a prototype with a relaxation torque are presented. For volume 1; see ESR-97066. ESA

N76-22555# Control Data Corp., Palo Alto, Calif.

THREE-DIMENSIONAL THERMAL AND STRESS ANALYSIS OF A PIPING TREE Final Report

R. B. Wight and R. A. Selby Nov. 1975 128 p
(PB-247323/9; SES/PSD-75/002; EPRI-276-FR) Avail: NTIS HC $6.00 CSCL 13K

A preliminary analysis was conducted on the thermal and stress states in a piping tee used for mixing bulk fluid streams, and which has experienced failure in nuclear reactor service. A thermal analysis was performed to obtain a steady-state thermal map for the mixing of two fluids having a 480 F bulk fluid temperature difference. Resulting thermal gradients were applied to a three-dimensional finite element model and an elastic stress analysis was performed to obtain the resulting stress contours. These results were then used to perform a fatique life evaluation according to the rules of the Boiler and Pressure Vessel Code. GRA

N76-22556# Martin Marietta Labs., Baltimore, Md.

APPLICATION OF CHEMOMECHANICAL EFFECTS TO FRACTURE-DEPENDENT INDUSTRIAL PROCESSES

A. R. C. Westwood and John J. Mills Sep. 1975 31 p refs (Grants NSF APR-73-07787; NSF DMR-75-05443)
(PB-246741/3; MML-TR-75-39C; NSF/RA/T-75-034) Avail: NTIS HC $4.00 CSCL 13H

The creation of new surface area by fracturing is fundamental to much of materials processing technology. Yet relatively little scientific attention has been given to improving the efficiency of such fracture-dependent operations as comminution, grinding, machining, drilling and tunneling by developing means of facilitating the fracture processes involved. This paper considers the possibility of applying chemomechanical effects--the effects of absorbed surface-active species on near-surface flow and fracture properties--to this end. Estimates indicate that such effects could be successfully applied to produce a 10 percent reduction in the cost of operations mentioned above. GRA

N76-22557# British Steel Corp., Sheffield (England).

EVALUATION OF DELORO STELLITE HARD FACING FUSE PASTE C

J. Smart and B. S. Butler Oct. 1975 11 p
(PB-246882/5; GS/PROD/176/18/75/C) Avail: NTIS HC $3.50 CSCL 13H

An evaluation of Deloro Stellite hard facing fuse paste C has been carried out as part of an evaluation program of hard facing processes. It has been shown that a hard wear resistant surface can be successfully produced in one layer requiring no further treatment before service and that peak hardness values in excess of 1200Hv can be readily achieved. Mechanical restraint

has been shown to control the levels of distortion without adversely affecting the quality of the deposit. The thin layers (approximately equal to 3.5mm), which are a limiting feature of the process at the present time, together with the intrinsic brittleness of the deposit would preclude their use in conditions of severe impact abrasion. GRA

N76-22558# Bartlesville Energy Research Center, Okla.
EVALUATION OF DIESEL ENGINE PERFORMANCE WITH INTAKE AND EXHAUST SYSTEM THROTTLING. VOLUME 1: TEXT AND APPENDIXES A THROUGH H Final Report, Nov. 1972 - May 1974
R. Hern and W. Marshall Nov. 1975 148 p refs Sponsored by DOT
(PB-247752/9; DOT-TSC-OST-74-42.1-Vol-1) Avail: NTIS HC $6.00 CSCL 20A

The diesel engine itself is an important source of diesel powered vehicle noise, and becomes dominant after proper treatment of intake/exhaust and cooling system noise at vehicle speeds below fifty miles per hour. An investigation is reported, in two volumes, to quantify the effects of intake and exhaust restrictions, and load-speed scheduling on the radiated noise from four diesel truck engines, produced by different manufacturers. Sound power measurements were made in an acoustically modified engine performance test cell. The noise associated with intake, exhaust, cooling and their respective ducting systems were appropriately abated to permit quantification of engine radiate noise. Exhaust emission data including temperature and performance data were also monitored. GRA

N76-22559# Bartlesville Energy Research Center, Okla.
EVALUATION OF DIESEL ENGINE PERFORMANCE WITH INTAKE AND EXHAUST SYSTEM THROTTLING. VOLUME 2: APPENDIX 1 Final Report, Nov. 1972 - May 1974
R. Hern, B. Eccleston, and W. Marshall Nov. 1975 190 p refs Sponsored by DOT
(PB-247753/7; DOT-TSC-OST-74-42.11-Vol-2) Avail: NTIS HC $7.50 CSCL 20A

The data are presented for the diesel engine noise study including an engine sound power level analysis, and sound spectrums showing the effect of intake and exhaust restrictions. GRA

N76-22560# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
HOOK ANCHOR TESTS IN FROZEN AND UNFROZEN GROUND
Austin Kovacs May 1975 38 p
(DA Proj. 1T0-62112-A-130)
(AD-A011250; CRREL-SR-229) Avail: NTIS CSCL 13/2

The findings of an exploratory study of the holding capacity of hook anchors in frozen and unfrozen ground are presented. Testing revealed that hook anchors are capable of being driven and retrieved from frozen silt and that their holding capacity was reasonably high in comparison to their size. Hook anchor capacity in the frozen silt at -2 C was found to be three times higher than in the unfrozen silt. GRA

N76-22561# AiResearch Mfg. Co., Phoenix, Ariz.
MARINE CLOSED GAS TURBINE AND LNG REFRIGERATION SYSTEM STUDY, EXECUTIVE SUMMARY Final Report
R. A. Rackley 30 Jun. 1974 50 p
(Contract C-3-36300)
(PB-248098/6; MA-RD-920-75002; Rept-74-310632-2) Avail: NTIS HC $4.00 CSCL 21E

A conceptual design study was conducted to develop a family of closed gas turbine engines satisfying many marine applications. Complete engine systems, including rotating group, heat exchangers, heat source, and control system were designed for both 9,000 hp auxiliary electro-mechanical units, and small craft propulsion engines and also for 40,000 60,000 and 80,000 hp helium cycle ship's propulsion engines. Further studies conducted revealed the closed gas turbine installations to other definite economic advantages to the maritime industry, compared to steam, diesel or open cycle gas turbine plants. A second design study was conducted to analyze systems to control cargo boil-off from LNG tankers and to assess the impact of such systems on the economics of these tankers. GRA

N76-22562# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A METHOD FOR REGULATING THE RESISTANCE WELDING PROCESS
V. I. Moiseyev 28 Nov. 1975 8 p Transl. into ENGLISH from Russian Patent no. 429915, 30 May 1974 p 1-2
(AD-A018548; FTD-ID(RS)I-2375-75) Avail: NTIS CSCL 13/8

Resistance welding used to join thin parts in the production of electrode instruments is considered. A method is proposed to control the process and eliminate splashing and stabilize the dimensions of the weld. J.M.S.

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N76-22563*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Metallurgy Div.
PROCEEDINGS OF THE 22D MEETING OF THE MECHANICAL FAILURES PREVENTION GROUP
T. Robert Shives and William A. Williard Dec. 1975 369 p refs Meeting held at Anaheim, Calif, 23-25 Apr. 1975 Prepared in cooperation with FAA, NBS, Washington, D. C. and ONR, Arlington, Va.
(NASA-TM-X-73005; PB-248254/5; CNBS-SP-436) Avail: NTIS HC $10.50 CSCL 14B

These Proceedings consist of a group of nineteen submitted papers and discussions from the 22nd meeting of the Mechanical Failures Prevention Group which was held at the Grand Hotel in Anaheim, California on April 23-25, 1975. Failure detection, diagnosis, and prognosis represent the central theme of the Proceedings. Technology and techniques, ongoing diagnostic programs, and coming requirements in the field of DD and P are discussed. In addition, several case histories are presented. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N76-22564 Naval Research Lab., Washington, D.C. Shock and Vibration Information Center.
THE SHOCK AND VIBRATION DIGEST, VOLUME 7, NUMBER 12
Dec. 1975 160 p refs
(AD-A018778) Avail: SVIC, Code 8404, Naval Research Laboratory, Washington, D. C. 20375 at HC annual subscription rate of $40.00 CSCL 13/13

Review articles were presented dealing with the following areas: (1) eigenvalue extraction for very large matrices, (2) optimum design of structures under shock and vibration environment, and (3) aircraft flutter research. The following information was also included: list of short courses, technical notes, abstracts from the current literature, book reviews, annual author index. For individual titles, see N76-22565 through N76-22567.

N76-22565* Naval Research Lab., Washington, D.C.
ALARM: A HIGHLY EFFICIENT EIGENVALUE EXTRACTION ROUTINE FOR VERY LARGE MATRIXES
I. U. Ojalvo *In its* Shock and Vibration Bull., Vol. 7, No. 12, Dec. 1975 Dec. 1975 p 3-9 refs (For availability see N76-22564 13-39)

(Contract NAS1-10635)
CSCL 13/13

A highly efficient computer program, called ALARM, for the determination of eigenvalues and eigenvectors of large symmetric matrices (over 10,000 degrees of freedom), was described. As such, it is highly useful for analyzing complex finite element and finite difference idealizations encountered in structural dynamics and acoustic probelms. The program is based upon a scheme which reduces a large matrix to an equivalent tridiagonal one of much smaller size. The main strength of the algorithm lies in its ability to retain all the information required to obtain the eigenvalues at either end of the original matrix spectrum.
Author

N76-22566 Indian Inst. of Tech., Kanpur. Dept. of Mechanical Engineering.
OPTIMUM DESIGN OF STRUCTURES UNDER SHOCK AND VIBRATION ENVIRONMENT
S. S. Rao *In* NRL The Shock and Vibration Bull., Vol. 7, No. 12, Dec. 1975 Dec. 1975 p 61-70 refs (For availability see N76-22564 13-39)
CSCL 13/13

A state-of-art discussion of the optimum design of structures under shock and vibration environment was presented. More specifically, a review of the structural optimization work involving dynamic constraints is presented. The following aspects were discussed, depending on the type of major behavior constraints considered in the optimization problem: (1) design to satisfy natural frequency requirements, (2) design to satisfy dynamic response restrictions, (3) design with flutter constraints, (4) design of vibration isolators and absorbers, (5) design to satisfy probabilistic constraints. Some of the unresolved problems were also identified, and the scope for future research in this area was given.
Author

N76-22567 Indian Inst. of Tech., Kanpur. Dept. of Aeronautical Engineering.
SOME RECENT TRENDS IN AIRCRAFT FLUTTER RESEARCH
P. N. Murthy *In* NRL The Shock and Vibration Bull., Vol. 7, No. 12, Dec. 1975 Dec. 1975 p 71-76 refs (For availability see N76-22564 13-39)
CSCL 13/13

Research and development work completed during the last 3 to 5 years in the area of aircraft flutter (excluding, however, the subject of panel flutter) was reviewed. The following areas were discussed: (1) modelling of the aircraft, (2) critical modes for flutter, (3) effect of additional masses, (4) solution of flutter determinant, (5) system identification, and (6) flutter control and prevention. The most important of the technological innovations in the area of flutter control and prevention is the feedback control loop leading to the now well-known control configured vehicles.
Author

N76-22568 Maryland Univ., College Park.
FATIGUE BEHAVIOR OF STRUCTURAL COMPONENTS SUBJECTED TO VARIABLE AMPLITUDE LOADING Ph.D. Thesis
Kentaro Yamada 1975 186 p
Avail: Univ. Microfilms Order No. 76-8459

The fatigue behavior is evaluated of structural components of highway bridges subjected to service stresses. The three main aspects of this investigation are: (1) a study of the service stresses observed in highway bridges; (2) fatigue tests of cover plated beams and welded beams with groove welded flanges, under both constant and variable amplitude loading; and (3) a study of variable amplitude fatigue life prediction using linear elastic fracture mechanics. A total of 106 stress range histograms previously recorded on highway bridges are reviewed, and a probability density function which represents an average stress histogram of highway bridges is derived.
Dissert. Abstr.

N76-22569 Texas Univ., Austin.
THE EFFECT OF BEAM YIELDING ON STEEL COLUMN STRENGTH Ph.D. Thesis
Virat Laosirichon 1975 190 p
Avail: Univ. Microfilms Order No. 76-8059

The effect of beam yielding on the strength of columns in continuous frames has been investigated in both experimental and theoretical studies. The experimental program consisted of ten stability tests and two beam column tests conducted on three full size specimens. Each specimen simulated a portion of an unbraced frame. In a stability test, the buckling load of the restrained column was determined. In the beam column tests, the ultimate strength of the column under combined axial and lateral loads was examined. The main variables considered in the test program were the magnitude of beam moment and the degree of yielding on the restraining beams prior to column loading. The purpose of these tests was to determine if yielding in the beams would affect the load carrying capacity of the column. The experimental results were compared with theoretical predictions and a reasonable agreement has been obtained.
Dissert. Abstr.

N76-22570 Wisconsin Univ., Madison.
FIVE HYBRID ELEMENTS FOR THE ANALYSIS OF THICK, THIN OR SYMMETRICALLY LAYERED PLATES AND SHELLS Ph.D. Thesis
Samaan George Ladkany 1975 353 p
Avail: Univ. Microfilms Order No. 75-23851

Two rectangular plate elements, two annular plate elements and a cylindrical shell element were derived, using the assumed-stress hybrid finite element principle of T. H. H. Pian. The elements have differing stress modes, however the boundary displacements for the plane stress elements were assumed to vary as linear functions of the arc length around the boundaries. A method was derived to treat sandwich or symmetrically stacked, three layered elements by reducing their cross section to that of an equivalent homogeneous element. The layers can be orthotropic with the top and bottom layers having the same thickness. A large computer program was written to test the new elements, using separate subroutines for each new element. Dissert. Abstr.

N76-22571 Purdue Univ., Lafayette, Ind.
TRUSS RELIABILITY AS RELATED TO VARIABILITY IN MODULUS OF ELASTICITY OF THE CONSTITUENT MEMBERS Ph.D. Thesis
Franklin Edward Woeste 1975 142 p
Avail: Univ. Microfilms Order No. 76-7158

The effect of modulus of elasticity variation in the component members of a King-Post truss was investigated. A concept of truss reliability was formulated. All of the members of the semirigidly jointed truss were considered as one long continuous member which is analogous to the weakest link hypothesis. A modified combined stress equation was used to define a strength fraction. Both numerators and denominators of the strength fraction equation were treated as random variables. The strength fraction was evaluated by a linear matrix structural analysis program; the assumption being that large strength fractions occur in weak members which behave linearly.
Dissert. Abstr.

N76-22572 Purdue Univ., Lafayette, Ind.
SIMULATION OF FLOW-INDUCED STRUCTURAL VIBRATION Ph.D. Thesis
Yang-sheng Lin 1975 206 p
Avail: Univ. Microfilms Order No. 76-7096

The vortex-induced vibration was studied for a circular cylinder subject to the wind loading with fluid elastic effect as a feedback to the system. The vibration of a flexible elastic cantilever circular cylinder due to the wind loading was simulated with the use of a digital computer. The response analysis of the structure was performed in the time domain using the modal method. The generalized random force was numerically simulated in the time domain using a fast Fourier transform technique. A survey of recent literature reveals two important characteristics in this subject. Firstly, the system displays a strong interaction in which the motion of the structure influences the aerodynamic load which causes the motion. Secondly, the fluctuating lift force on a vibrating circular cylinder exhibits a lock-in phenomenon in which the aerodynamic Strouhal frequency coincides with and is equal to the vibrating frequency.
Dissert. Abstr.

N76-22573 Maryland Univ., College Park.
A GENERALIZED FINITE DIFFERENCE ELEMENT FOR THE THERMOELASTIC STRUCTURAL RESPONSE OF ANISOTROPIC THIN SHELLS Ph.D. Thesis

Robert Joseph Edwards 1975 313 p
Avail: Univ. Microfilms Order No. 76-8837

Two well established matrix methods for thin shell structural analysis, the finite element method and the finite difference energy method, have been integrated into one unified analytical approach and have been effectively applied to the thermoelastic analysis of anisotropic thin shells. The SHEFA generalized finite difference element for the thermoelastic analysis of anisotropic thin shells is developed herein. Shell surface geometry is described in terms of curvilinear surface coordinates using tensor notation. The deformation of the shell is described by the linear strain and curvature change tensors of Sanders.
Dissert. Abstr.

N76-22574 Iowa State Univ. of Science and Technology, Ames.
EXPERIMENTAL RANDOM LOADING CHARACTERISTICS IN STRUCTURAL FATIGUE AND DESIGN Ph.D. Thesis
Jang Moo Lee 1975 223 p
Avail: Univ. Microfilms Order No. 76-9185

Characterization and analysis of complex load histories on a statistical basis were made through use of a quasi-stationary random concept. This concept was applied to simulation of the three Society of Automative Engineers (SAE) standard load history profiles being used to evaluate laboratory fatigue studies of vehicle components which range from variable RMS narrow band random to variable RMS, variable mean, and wide band random load histories. The results show that a wide variety of load histories can be well simulated using these techniques.
Dissert. Abstr.

N76-22575 Syracuse Univ., N.Y.
CURVILINEARLY CORRUGATED PLATES UNDER UNIFORM PRESSURE Ph.D. Thesis
Timothy Tyler Schenck 1974 142 p
Avail: Univ. Microfilms Order No. 76-7936

An analysis of curvilinearly corrugated plates subjected to uniform pressure on one side is undertaken and the results verified experimentally. The cross section profile is defined as having a sinusoidally varying curvature in an attempt to match the profile shape of commercially available corrugated plates. The plate is assumed to comprise an infinite number of corrugations and hence the behavior of any one corrugation is considered typical. As in frame theory, middle surface transverse stresses are assumed zero, a deformation field hypothesized, and the Total Potential Energy (TPE) formulated for one corrugation. Minimization of the TPE yields a system of differential equations and natural boundary conditions which are then solved for selected geometric boundary conditions.
Dissert. Abstr.

N76-22576 Oklahoma State Univ., Stillwater.
NONLINEAR AND LARGE DISPLACEMENT BEHAVIOR OF PORTAL FRAMES SUBJECTED TO IMPULSE LOADING Ph.D. Thesis
George Mack Riddle 1975 124 p
Avail: Univ. Microfilms Order No. 76-9756

The purpose of this research is to develop a method of analysis, considering nonlinear and large displacement behavior, for plane, reinforced concrete portal frames subjected to the effects of impulse loading. The reinforced concrete frame is treated as a lumped parameter model made up of bar and spring elements which have force-deformation characteristics derived from the properties of the frame. The bars are axially deformable, flexurally rigid and are connected at the nodes (joints) by flexural hinges. Any static loading and distributed impulse loads can be applied. Linear and small deflection theories are used to solve for static deflections. Nonlinear and large displacement behavior are considered for the dynamic response. The history of the response of the frame to collapse is traced. A mathematical model for analysis of portal frames subjected to both static and dynamic loads has been developed and a computer program based on the model has been written.
Dissert. Abstr.

N76-22577 Rutgers Univ., New Brunswick, N.J.
STUDIES ON THE VIBRATION AND BUCKLING OF ELLIPTIC MEMBRANES AND PLATES Ph.D. Thesis
Galip Ali Oezkul 1975 86 p
Avail: Univ. Microfilms Order No. 76-7318

Analyses are presented of three problems of solid mechanics with elliptic peripheries. These are the vibration of an elliptic ring membrane with clamped edges, the buckling of a simply supported elliptic plate under uniform compression, and the vibration of an elliptic ring plate with clamped edges. Their behavior is described by well-known small deflection theories of membranes and plates. Formal solutions of these problems are expressed in terms of Mathieu functions and modified Mathieu functions. Consideration is given to the modes in which the displacements are symmetric to the major and minor axes. Transition to corresponding circular cases is discussed using degenerate forms of the Mathieu functions. Numerical results of the fundamental frequency of vibration and the critical (buckling) load are obtained for various eccentricities of the elliptic edges.
Dissert. Abstr.

N76-22578 Purdue Univ., Lafayette, Ind.
VIBRATORY DETERMINATION OF BEAM COMPLIANCE AND PREDICTION OF COLUMN BUCKLING Ph.D. Thesis
Paul Francis Mlakar 1975 197 p
Avail: Univ. Microfilms Order No. 76-7106

The buckling loads of structural systems depend upon the boundary conditions at the system's supports. A nondestructive method of identifying these boundary conditions provides a useful evaluation of these systems' buckling loads. In this thesis the boundary conditions are modeled by rotational and translational springs with unknown spring constants. The use of vibration test data to estimate the constants and predict the buckling loads for a simple elastic beam column is analytically and experimentally studied.
Dissert. Abstr.

N76-22579 Cornell Univ., New York.
BENDING OF LAMINATED BEAMS Ph.D. Thesis
King Him Lo 1975 93 p
Avail: Univ. Microfilms Order No. 76-8146

Three different features of problems encountered in the analysis of bending of laminated beams are considered - the effects of different values of Poisson's ratio on the bending analysis, the effects of interface conditions on deflections, and the validity of the assumptions of plane stress and plane strain in the stress analysis of laminated beams.
Dissert. Abstr.

N76-22580*# George Washington Univ., Washington, D.C.
SYMMETRIES IN LAMINATED COMPOSITE PLATES
Ahmed K. Noor [1976] 23 p refs Presented at the 8th Southeastern Conf. on Theoret. and Applied Mech., Blacksburg, Va., 29-30 Apr. 1976; sponsored by Va. Polytech. Inst. and State Univ. Sponsored by NASA
(NASA-CR-147105) Avail: NTIS HC $3.50 CSCL 13M

The different types of symmetry exhibited by laminated anisotropic fibrous composite plates are identified and contrasted with the symmetries of isotropic and homogeneous orthotropic plates. The effects of variations in the fiber orientation and the stacking sequence of the layers on the symmetries exhibited by composite plates are discussed. Both the linear and geometrically nonlinear responses of the plates are considered. A simple procedure is presented for exploiting the symmetries in the finite element analysis. Examples are given of square, skew and polygonal plates where use of symmetry concepts can significantly reduce the scope and cost of analysis.
Author

N76-22581*# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
COMPARISON OF ACOUSTIC AND STRAIN GAUGE TECHNIQUES FOR CRACK CLOSURE MEASUREMENTS Final Report, 17 Apr. - 31 Dec. 1975
Otto Buck, R. V. Inman, and J. D. Frandsen 10 May 1976 40 p refs
(Contract NAS1-13883)
(NASA-CR-144968; SC5032.22FR) Avail: NTIS HC $4.00 CSCL 20K

A quantitative study on the systems performances of the COD gauge and the acoustic transmission techniques to elastic deformation of part-through crack and compact tension specimens has been conducted. It is shown that the two instruments measure two completely different quantities: The COD gauge yields information on the length change of the specimen whereas the acoustic technique is sensitive directly to the amount of contract area between two surfaces, interfering with the acoustic signal. In another series of experiments, compression tests on parts

with specifically prepared surfaces were performed so that the surface contact area could be correlated with the transmitted acoustic signal, as well as the acoustic with the COD gauge signal. A linear relation between contact area and COD gauge signal was obtained until full contact had been established.
Author

N76-22582*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
SURVEY AND DEVELOPMENT OF FINITE ELEMENTS FOR NONLINEAR STRUCTURAL ANALYSIS. VOLUME 1: HANDBOOK FOR NONLINEAR FINITE ELEMENTS Final Report
16 Mar. 1976 165 p refs
(Contract NAS8-30626)
(NASA-CR-144276) Avail: NTIS HC $6.75 CSCL 13M

A survey of research efforts in the area of geometrically nonlinear finite elements is presented. The survey is intended to serve as a guide in the choice of nonlinear elements for specific problems, and as background to provide directions for new element developments. The elements are presented in a handbook format and are separated by type as beams, plates (or shallow shells), shells, and other elements. Within a given type, the elements are identified by the assumed displacement shapes and the forms of the nonlinear strain equations. Solution procedures are not discussed except when a particular element formulation poses special problems or capabilities in this regard. The main goal of the format is to provide quick access to a wide variety of element types, in a consistent presentation format, and to facilitate comparison and evaluation of different elements with regard to features, probable accuracy, and complexity. Author

N76-22583*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
SURVEY AND DEVELOPMENT OF FINITE ELEMENTS FOR NONLINEAR STRUCTURAL ANALYSIS. VOLUME 2: NONLINEAR SHELL FINITE ELEMENTS Final Report
16 Mar. 1976 138 p refs
(Contract NAS8-30626)
(NASA-CR-144277) Avail: NTIS HC $6.00 CSCL 13M

The development of two new shell finite elements for applications to large deflection problems is considered. The elements in question are doubly curved and of triangular and quadrilateral planform. They are restricted to small strains of elastic materials, and can accommodate large rotations. The elements described, which are based on relatively simple linear elements, make use of a new displacement function approach specifically designed for strongly nonlinear problems. The displacement function development for nonlinear applications is based on certain beam element formulations, and the strain-displacement equations are of a shallow shell type. Additional terms were included in these equations in an attempt to avoid the large errors characteristic of shallow shell elements in certain types of problems. An incremental nonlinear solution procedure specifically adopted to the element formulation was developed. The solution procedure is of combined incremental and total Lagrangian type, and uses a new updating scheme. A computer program was written to evaluate the developed formulations. This program can accommodate small element groups in arbitrary arrangements. Two simple programs were successfully solved. The results indicate that this new type of element has definite promise and should be a fruitful area for further research. Author

N76-22584*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DETAILED REQUIREMENTS DOCUMENT FOR THE INTEGRATED STRUCTURAL ANALYSIS SYSTEM, PHASE B
John A. Rainey Jan. 1976 632 p refs
(Contract NAS9-12200)
(NASA-CR-147550; LEC-5809; JSC-09811) Avail: NTIS HC $16.25 CSCL 13M

The requirements are defined for a software system entitled integrated Structural Analysis System (ISAS) Phase B which is being developed to provide the user with a tool by which a complete and detailed analysis of a complex structural system can be performed. This software system will allow for automated interface with numerous structural analysis batch programs and for user interaction in the creation, selection, and validation of data. This system will include modifications to the 4 functions developed for ISAS, and the development of 25 new functions. The new functions are described. Author

N76-22585# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
NONLINEAR VIBRATION AND FLUTTER OF STRESSED SKEW PANELS
P. S. Nair and S. Durvasula Oct. 1975 47 p refs Revised Supersedes AE-313S
(AE-331S-Rev; AE-313S) Avail: NTIS HC $4.00

Von Karman plate equations are used to study the influence of nonlinearity on the period of vibration in unstressed and stressed skew plates. The equations of motion for flutter derived through Lagrange's equations are solved by an analog computer and also by direct numerical integration. The nature of flutter motion of buckled and unbuckled panels and the transitions from the buckled stable to flat stable configurations with increasing dynamic pressure are discussed. The influence of the aerodynamic damping term on the dynamic pressure parameter is also examined. Author

N76-22586# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
THERMAL BUCKLING OF SKEW PLATES
M. S. S. Prabhu and S. Durvasula Mar. 1974 45 p refs
(AE-320S) Avail: NTIS HC $4.00

The thermal stress and buckling characteristics were studied of isotropic simply supported and clamped skew plates with fully restrained edges. The stress problem is solved using the Galerkin method and the resulting stress distributions are used for the buckling analysis. Numerical results for several new configurations are presented and the effects of side ratio, skew angle, degree of non-uniformity on thermal buckling parameters are discussed. It is observed that in-plane boundary conditions have significant effect on thermal buckling behavior of skew plates. Author

N76-22587# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
EFFECT OF SHAPE IMPERFECTIONS ON THE BUCKLING OF STIFFENED CYLINDERS
Ion Eugen Boros May 1975 137 p refs
(Grant NRC-A-2783)
(UTIAS-TN-200; CN-ISSN-0082-5255) Avail: NTIS HC $6.00

The buckling of ring and stringer stiffened cylinders under axial compression, external hydrostatic pressure and combined loading of axial compression with internal or external hydrostatic pressure was studied. The effect of initial sinusoidal axisymmetric and asymmetric shape imperfections on the reduction of the buckling strength of stiffened cylinders was investigated for varying reinforcement parameters. Calculations were performed by extending Koiter's special theory taking into account nonlinear prebuckling deformations in the form of the shape imperfection, the eccentricity and the bending stiffness of the ring stiffeners. The Donnell-von Karman shell equations were solved using the Galerkin method. The quantitative effect of asymmetric shape imperfections (in the form of the buckling mode) on reducing the buckling strength of stringer stiffened shells was determined with Hutchinson's Model and experimentally investigated on four stringer stiffened cylinders. Author

N76-22588# Danish Atomic Energy Commission, Risoe.
FAILURE AND ELASTICITY OF CONCRETE
N. S. Ottosen 21 Jul. 1975 81 p refs
(RISO-M-1801) Avail: ERDA Depository Libraries HC $7.25

A four-parameter failure criterion is proposed. It has all the required properties concerning smoothness including convexity, symmetry, and curved meridians, and gives a close estimate of experimental failure stresses for complete general stress states. General criteria for failure mode and elastic limits are proposed and compared with experimental results. Some of the most important published failure tests and failure criteria are discussed. Author (NSA)

N76-22589# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.

EFFECTS OF VISCOELASTICITY ON ADHESIVE JOINTS [EINFLUESSE DER VISKOELASTIZITAET AUF KLEBEVERBINDUNGEN]
Michael Glahn 1975 121 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft
(ILR-7; ISBN-3-7983-0545-5) Avail: NTIS HC $5.50

The effects were investigated of a viscoelastic adhesive layer on the stress and deformation variations in the adhesive and in the joints of adhesive bonds loaded during a long time or subjected to temperature. The work was restricted to mathematical one-dimensional problems, i.e. to adhesive bonds with straight parallel or central force transmission. Two approximation methods were used. The step method relates the statically undetermined calculation of stresses and deformation via finite elements to the recursive consideration of adhesion relaxation, derived from the Duhamel integral. The quasi-elastic method neglects the load history and replaces the adhesive's elasticity modulus by its creep modulus. Both methods indicate stress reduction but a clear increase of shear deformation in the adhesive. ESA

N76-22590# Southampton Univ. (England). Inst. of Sound and Vibration Research.
THE FLEXURAL VIBRATIONS OF A LINE-STIFFENED PLATE WITH FLUID LOADING
V. Williams and F. J. Fahy Feb. 1975 87 p refs Sponsored by Admiralty Underwater Weapons Estab.
(ISVR-TR-74) Avail: NTIS HC $5.00

Various approaches to the problem of wave propagation on a fluid loaded plate bearing stiffening beams are presented. The vibrations of an infinite fluid loaded plate bearing a finite number of parallel line stiffeners were calculated. The calculations do not explicitly rely on the existence of a propagation constant. Manipulation of the cosine transforms allowed the problem to be recast as a set of linear algebraic equations. This approach has been interpreted numerically in computer programs (5280, 522N, SIGL, PR6N) listed. Some special cases are considered: propagation constants on a plate with line masses equally spaced without fluid loading and vibrations of a plate with small internal losses and, respectively, light and heavy fluid loading. ESA

N76-22591# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
EXTENSION OF THE ENERGY- AND GRADIENT METHODS SPECIFIC TO CERTAIN ELEMENTS, FOR OPTIMAL DIMENSIONING OF STRUCTURES [ELEMENTSPEZIFISCHE ERWEITERUNG DES ENERGIEUND GRADIENTENVERFAHRENS ZUR OPTIMALEN DIMENSIONIERUNG VON TRAGWERKEN]
H. P. Mlejnek, J. Buehlmeier, R. Goos, and M. M. Mai Jun. 1975 140 p refs In GERMAN Sponsored by Ges. fuer Weltraumforsch.
(ISD-176) Avail: NTIS HC $6.00

The weight optimization of spacecraft structures is discussed. Specifically for simple structural elements: bar with constant elongation, triangle with constant elongation, beam in space, (full and sandwich), bar with linear elongation, and triangle with linear elongation. The necessary element aspects were developed for the gradient method and for the energy method, in the case of a static design for stress, displacement, and dimensioning limits. A new strategy is developed in dealing with displacement limits and the energy method, in which the Gellatly method, based on optimality criteria, is replaced by an extension of Venkayya's method, based on displacement gradients. ESA

N76-22592# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen
DEVELOPMENT AND MAINTENANCE OF LARGE FINITE ELEMENT PROGRAM SYSTEMS
Ernst Schrem 1975 20 p refs Presented at the ONR/NSF Symp. on Struct. Mech. Software, College Park, USA, 12-14 Jun. 1974
(ISD-180) Avail: NTIS HC $3.50

The aspect of sharing large scale software systems for finite element analysis is discussed. Successful sharing is dependent upon user support and program maintenance. Programming systems, provided their design corresponds to the present state-of-the-art in software engineering, could offer some solution to this problem. Conventional sharing of integral software packages will be replaced by structured software sharing, where cheap and highly reliable modules of a program system are selected and combined with in-house software. ESA

N76-22593# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
FINITE ELEMENT SOFTWARE IN THE NEXT DECADE
Ernst Schrem 1975 19 p refs Presented at the Congr. on Finite Element Methods in Struct. Mech., Bournemouth, Engl., 12-17 Oct. 1975
(ISD-181) Avail: NTIS HC $3.50

Projections of hardware technology are cited. The future role of pipeline and array processors in finite element software is considered. Concepts of modularization by information-hiding and of coordinated structuring of problem, data, and program are assumed to form the basis of finite element software systems in the next decade. A collection of strategies for developing more reliable programs is presented together with a discussion of the importance of the user-system interface with respect to overall computer system reliability. General prospects of hardware, pre-and postprocessors, finite element software development activities, programming methodology, and user training are forecast for the period 1975-1985. Author (ESA)

N76-22594# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
WIND TUNNEL TESTS OF THE AEROELASTIC STABILITY OF THE HEER-AGIMONT BRIDGE
D. Olivari and F. Thiry Jun. 1975 58 p Sponsored in part by Ateliers de Jambes
(VKI-TN-113) Avail: NTIS HC $4.50

To investigate in a wind tunnel, the aeroelastic stability of the suspension bridge erected at Heer-Agimont (Belgium), tests were carried out on a sectional model of the bridge at a scale of 1/50 and on a model of the full bridge at a scale of 1/100. In both cases, the dynamic characteristics (mass distribution, stiffness and degrees of freedom) of the bridge were simulated with the appropriate scaling rules. The experiments were made in the open test section of the 3 m diameter L-1 wind tunnel. The wind velocity was varied until critical conditions, corresponding to self sustained bridge oscillation, were reached. Wind velocity, frequency of oscillations, mode and amplitude of the oscillations were recorded and used to define the stability characteristics of the bridge. Author (ESA)

N76-22595# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MIXED ELASTICITY VARIATIONAL PRINCIPLE AND APPLICATION TO NUMERICAL ANALYSIS OF PLATE BENDING Ph.D Thesis - Paris Univ., Jun. 1973
Bernard Thomas 1974 84 p refs In FRENCH; ENGLISH summary Report will also be announced as translation
(ONERA-NT-233) Avail: NTIS HC $5.00

The theoretical study and controlled application of the Reissner and Fraeijs de Veubecke principle are studied. The principle is re-established from the weak formulation of the mixed problem dealing with displacements and stresses. The solution of the elastic problem is simultaneously the unique stationary point and the unique saddle-point. Various extensions are suggested. The finite element approximation of the principle is given and the example of a plate in bending is treated. The finite element used is adapted to numerical analysis of thick plates and secures displacement and stress continuity in the whole plate. The results are compared to those given by the displacement method and to experimental results. The stresses on the surface of the plate are measured by means of two experiments which need bonding of a photoelastic coating to the plate: a photoelastic experiment giving the difference and orientation of principal stresses; a test by holographic interferometry giving the sum of principal stresses. Author (ESA)

N76-22596# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LINEAR BUCKLING OF STRUCTURES. APPLICATION TO CALCULATION OF PLATES BY FINITE ELEMENTS Ph.D. Thesis - Paris Univ.
Germaine Nefussi 1975 70 p refs In FRENCH; ENGLISH summary Report will also be announced as translation

(ONERA-NT-1975-6) Avail: NTIS HC $4.50

Within the framework of linear elasticity an attempt is presented to link theoretical investigations with stability and usual buckling analysis. Two methods are used to obtain the general equations governing the instability of a given equilibrium state with regard, in each case, to the assumptions that lead to the classical buckling equations commonly used in analytical or numerical calculations. The case of the buckling condition for a trapezoidal plate subject to a somewhat complex inplane loading is considered using a finite element method. ESA

N76-22597# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

COMPUTED RESTITUTION OF STRUCTURAL NATURAL MODES FROM INAPPROPRIATE EXCITATIONS Ph.D. Thesis - Paris Univ.

Xuan Thanh Nguyen 1975 54 p refs In FRENCH; ENGLISH summary Report will also be announced as translation

(ONERA-NT-1975-9) Avail: NTIS HC $4.50

After recalling the theoretical bases and experimental methods used for ground vibration tests, the fundamental problem of modal data determination is formulated. The proposed method, which does not require the appropriation of the excitation forces, makes it possible to determine the vibratory characteristics of a linear, weakly damped structure from scannings around the resonance frequency of each mode with different configurations of excitation forces. After demonstrating that around the resonance frequency of a natural mode, and under an excitation appropriated to this mode, the significant points of the structure vibrate in phase, the determination of the whole set of modal data as well as of the configuration of appropriated excitation forces is obtained. The results calculated in this manner are perfectly comparable to those obtained with a test performed with conventional isolation processes. Author (ESA)

N76-22598# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

INTRODUCTION TO A FIGHTER AIRCRAFT LOADING STANDARD FOR FATIGUE EVALUATION (FALSTAFF)

G. M. VanDijk and J. B. DeJonge 20 May 1975 40 p refs Presented at the 8th Intern. Comm. on Aeron. Fatigue Symp., Lausanne, Switz., 2-5 Jun. 1975

(Contract RNLAF-RB-KLU-P.32)

(NLR-MP-75017-U) Avail: NTIS HC $4.00

Falstaff (Fighter Aircraft Loading Standard for Fatigue Evaluation), a loading history standard pertaining to fighter aircraft wing bending primarily governed by maneuver loadings, is derived in order to evaluate the fatigue performance of structural materials and components and to establish fatigue design charts. The present report concerns a joint international development effort involving Dutch, German, and Swiss institutes. Details are presented with regard to the general development philosophy and data sources considered. The development procedures followed are summarized. The results of some preliminary validation tests are reported. Author (ESA)

N76-22599# European Space Agency, Paris (France).

AN OPTIMIZATION METHOD APPLIED TO COMPOSITE STRUCTURES

Raoul Girard Dec. 1975 79 p refs Transl. into ENGLISH of 'Une Methode d'Optimisation Appl. aux Struct. Composites', ONERA, Paris Report ONERA-NT-228, 1974

(ESA-TT-227; ONERA-NT-228) Avail: NTIS HC $5.00

A method for optimizing elastic structures, based on the variational principles of continuum mechanics, is proposed. The use of these principles increases the performance of the effective numerical solution of the optimization problem by means of algorithms of mathematical programming. The method is used for the optimization of multilayer composites and sandwich panels. Author (ESA)

N76-22600# European Space Agency, Paris (France).

INVESTIGATIONS ON THE EFFECT OF SPECIMEN DIMENSIONS ON FRACTURE TOUGHNESS OF Ti-6 Al-4 V

Karl-Heinz Galda, Dietrich Minz et al Dec 1975 45 p refs Transl. into ENGLISH of 'Untersuch. zum Einfluss der Probendimensionen auf die bruchmechanischen Kennwerte von TiAl6V4', DFVLR, Cologne Report DLR-FB-75-42, 13 May 1975 Original German report available from DFVLR, Cologne DM 16.20

(ESA-TT-228; DLR-FB-75-42) Avail: NTIS HC $4.00

Fracture mechanics specimens of different dimensions were prepared from a plate 82 x 285 x 800 mm. Fracture toughness determined by the secant method is nearly independent of specimen thickness B for specimens with constant width W and increases with increasing width for specimens with constant thickness. For ASTM standard specimens with $W/B = 3$ K(Q) increases with increasing thickness also in a range of B in which the thickness requirement is fulfilled. The reason for this increase is that the crack resistance curve rises also if there is a plane strain state at the crack tip. Author (ESA)

N76-22601# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.

DYNAMIC SOIL-STRUCTURE INTERACTION Final Report. Ph.D. Thesis

Hung Leung Wong 23 May 1975 248 p refs Sponsored by NSF and Geological Survey

(PB-247233/0; EERL-75-01) Avail: NTIS HC $8.00 CSCL 13M

The dynamic response of a structure placed on a deformable soil medium subjected to seismic excitation is studied. The basic phenomenon of soil-structure interaction was investigated by several analytical models supplemented by experimental observations; a brief review of literature in this discipline is also included. Among the physical phenomena investigated: the effect caused by local topography, the interaction with other structures, and the dissipation of dynamic energy through the soil medium were described by exact series solutions. Foundations of arbitrary shape, however, were modeled by using an approximate integral representation. This latter method uses the principle of superposition and provides flexibility in analyzing numerically the three-dimensional disc foundations placed on the soil surface. In this thesis, the importance of the base input motion induced by incident seismic waves is also stressed, because the seismic input, along with the foundation compliances, is necessary for a complete analysis of this problem. GRA

N76-22602# California Dept. of Transportation, Sacramento. Div. of Structures.

FIELD EVALUATION OF CONCRETE POLYMERIZATION AS A BRIDGE DECK SEAL Final Report

Mickey W. Horn and Carl F. Stewart Dec. 1974 25 p

(PB-247464/1; CA-DOT-ST-4174-1-74-4) Avail: NTIS HC $3.50 CSCL 13C

Several monomer systems were applied to the Pit River bridge deck in an attempt to determine if a simple paint roller and squeegee application technique would be effective in producing an impermeable polymerized deck surface. Prior to monomer application, the deck surface was prepared by either steam cleaning, sand blasting or bushhammering. Polymerization was attempted by applying two monomer systems - styrene and methylmethacrylate - with various promoters and catalysts. In addition, a polyester was placed over some of the polymerizing systems to improve penetration of the underlying monomers. Permeability tests on concrete cores taken from the test areas showed that the application of monomers using paint rollers and squeegees was not a dependable method for field impregnation of monomers into concrete bridge decks. GRA

N76-22603# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.

EFFECTS OF THE CLARY SCREED AND TUBE FLOAT ON RIGID PAVEMENT CONSTRUCTION Final Report

Duane Amsler and James E. Bryden Aug. 1975 24 p refs

(PB-247695/0; NYSDOT-ERD-75RR-32) Avail: NTIS HC $3.50 CSCL 13B

Effects of the Clary screed and the tube float, used as finishing devices on portland cement concrete pavement placed with a slipform paver, were examined on six construction projects. Alternate sections were finished with and without the Clary screed on three projects, and on three others with either none, two, four, or six tube float passes. Pavement surface roughness was measured with a California profilograph and surface mortar samples were tested for compressive strength. Both devices helped close the pavement surface. GRA

N76-22604# Twin City Testing and Engineering Lab., Inc., St. Paul, Minn.
LIGNITE FLY ASH AS A PARTIAL REPLACEMENT FOR PORTLAND CEMENT IN CONCRETE Final Report
Terrence R. Dobie and Norman E. Henning Apr. 1975 119 p Prepared in cooperation with North Dakota State Highway Dept.
(PB-247414/6; Rept-8-3305) Avail: NTIS HC $5.50 CSCL 13C

A laboratory test program was undertaken to determine the effects of utilization of lignite fly ash as a substitute for various percentages of the Portland cement in concrete. Compressive and flexural strength properties were determined. The air voids systems were examined and rapid freeze thaw durability and resistance to deicer scaling tests performed. Reduction in mortar bar expansion and methods of determining available alkalies were also investigated. The results of the investigation indicate lignite fly ash can be used as a partial replacement for Portland cement in concrete to produce strong, durable concrete. GRA

N76-22605# Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
BRIDGE DECK DETERIORATION STUDY Final Report, Jun. 1973 - Mar. 1975
Joseph E. Ross Mar. 1975 41 p refs
(PB-247463/3; RR-85; LA-72-2C(B)-FR) Avail: NTIS HC $4.00 CSCL 13C

Investigated were three bridges in the northern section of Louisiana in an attempt to determine if there is sufficient deterioration and corrosion of the reinforcing steel to warrant a comprehensive study of bridge decks in this area of the state which is exposed to icing conditions during the winter months. GRA

N76-22606# Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
RAPID SETTING CONCRETE PATCHING STUDY Final Report, Aug. 1971 - Mar. 1975
Joseph E. Ross Mar. 1975 71 p
(PB-247465/8; RR-84; LA-71-1C(B)-FR) Avail: NTIS HC $4.50 CSCL 13C

Several different concrete mixtures and premixed materials are investigated for use as a rapid setting patching mix for maintenance patching. A more permanent solution than the placing of hot or cold mixed asphalt compounds into concrete voids was deemed necessary. The research included as many generic types of concrete patching materials as was possible under the existing funding of the project. These concrete patching materials were examined in the laboratory to determine the basic physical properties, then roadway patches using the same materials were placed and subjected to a field performance evaluation under traffic loading. GRA

N76-22607# California Dept. of Transportation, Sacramento. Div. of Structures.
DYNAMIC RESPONSE OF BRIDGES TO SEISMICALLY INDUCED GROUND VIBRATIONS. PHASE 1: PILOT FIELD TESTS, STRONG-MOTION INSTRUMENT INSTALLATION
J. H. Gates and R. E. Davis Jul. 1975 42 p Prepared in cooperation with Calif. State Business and Transportation Agency
(PB-248296/6; CA-DOT-DS-4164-75-5; FHWA-RD-75-S0423) Avail: NTIS HC $4.00 CSCL 13M

Strong motion accelerometers were installed on bridges located in three seismically active areas in California as a pilot project to assess installation problems and to compare usefulness of data furnished by different types of instruments. Instruments were installed during construction and on existing bridges. General guidelines and recommendations for future installations are presented. Data obtained from these installations during future seismic events will be used to assess validity of assumptions and analytical tools employed in the design process. GRA

N76-22608# California Univ., Berkeley. Earthquake Engineering Research Center.
THE DYNAMIC BEHAVIOR OF A FIRST STORY GIRDER OF A THREE-STORY STEEL FRAME SUBJECTED TO EARTHQUAKE LOADING
Ray W. Clough and Frank Lap-Yan Li Jul. 1975 99 p refs (Grant NSF GI-36387)
(PB-248841/9; EERC-75-35) Avail: NTIS HC $5.00 CSCL 13M

The behavior of a first floor girder of a three story steel frame subjected to earthquake loading is studied. The instrumentation was designed to measure the force and deformation time histories of the girder. The following aspects of the dynamic response are discussed: Yielding at the girder ends in the inelastic test and the permanent deformation caused by the dead load effect of the concrete blocks; joint rotations; the dynamic moment capacity of the girder; hysteretic behavior; and ductility ratio. GRA

N76-22609# Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
COLUMN RESEARCH COUNCIL, PROCEEDINGS, 1975 Annual Report
F. Cheong-Siat-Moy Dec. 1975 117 p refs
(PB-247687/7; LEHIGH/FL/217-75) Avail: NTIS HC $5.50 CSCL 13M

The 1975 proceedings contain summaries of papers presented at the technical session held on March 6-7, 1975 in Toronto Canada. A register of those who actively participate in the work of the Council, a financial statement, related publications and the Council By-Laws are also recorded. GRA

N76-22610# Syracuse Univ., N.Y. Dept. of Mechanical and Aerospace Engineering.
STIFFNESS AND STRESS ANALYSIS OF DISCRETELY ATTACHED CORRUGATED SHEAR WEBS WITH QUASI-SINUSOIDAL CORRUGATIONS
Lung-Hsiang Wu and Charles Libove Jul. 1975 98 p refs (Grant NSF ENG-72-04101-A02)
(PB-248728/8; MAE-5170-T5) Avail: NTIS HC $5.00 CSCL 13M

A theoretical analysis and numerical data are presented for the shear stiffness of curvilinearly corrugated shear webs with discrete attachments to framing members at the ends of the corrugations, and for the maximum transverse extreme-fiber flexural stresses and strains due to the cross-sectional deformations which arise during the shearing of such webs. The particular type of curvilinear cross-section assumed here is one in which the curvature varies sinusoidally from crest to trough. It was found that with discrete attachments these two types of curvilinear corrugations could differ significantly in their shear stiffness and in their transverse flexural stresses and strains. GRA

N76-22611# California Dept. of Transportation, Sacramento. Div. of Structures.
WIND LOADING ON FALSEWORK, PHASE 1 Final Report, Dec. 1974 - Jun. 1975
Henry D. Nix, Conrad P. Bridges, and Michael G. Power Jun. 1975 220 p
(PB-248033/3; CA-DOT-DS-4179-1-75-4; FHWA-RD-75-S0418) Avail: NTIS HC $7.75 CSCL 13B

Full size installations of modular tubular falsework were tested in a wind tunnel. The tests considered various tower spacings, wind velocities to 100 mph, oblique incidence of wind, and varying number of tower units in the wind stream. The angle of wind incidence and the number of towers in the wind stream were found to be major factors in determining the total wind load on a falsework bent. A design method, based on an empirically established wind velocity model and the test data, is presented. GRA

N76-22612# Texas Univ., Austin. Center for Highway Research.
FATIGUE AND REPEATED-LOAD ELASTIC CHARACTERISTICS OF INSERVICE ASPHALT-TREATED MATERIALS Research Report
Domingo Navarro and Thomas W. Kennedy Jan. 1975 96 p refs Prepared in cooperation with Texas Highway Dept.
(PB-248037/4; CFHR-3-9-72-183-2; FHWA-RD-75-S0411) Avail: NTIS HC $5.00 CSCL 13B

The results are described of an investigation of the fatigue life and repeated-load elastic properties of blackbase and asphalt concrete from inservice highways in Texas. Cores from seven

recently constructed highway pavements were obtained and tested under repeated tensile stresses using the repeated-load indirect tensile test. Experimental estimates of fatigue life, resilient modulus of elasticity, and resilient Poisson's ratio were made. In addition, an estimate of the variation of these properties to be expected in a highway was obtained. The relationships between the dynamic and fatigue properties and the static properties were also evaluated in an attempt to establish useful correlations. GRA

N76-22613# Texas Univ., Austin. Center for Highway Research.
THE BEHAVIOR OF MULTIPLE LAP SPLICES IN WIDE SECTIONS
Mark A. Thompson, James O. Jirsa, John E. Breen, and Donald F. Meinheit Jan. 1975 92 p refs
(PB-248295/8; CFHR-3-72-154-1; FHWA-RD-75-0421) Avail: NTIS HC $5.00 CSCL 13B

In order to investigate the behavior of lap splices of the reinforcing steel in reinforced concrete cantilever, twenty-five specimens were tested. The specimens were tested with the splice regions subjected to a constant moment along the length of the splice. This loading produced a stress condition as severe as that in the prototype. The main variables in the test program were the splice length and bar diameter, the ratio of the clear cover to the clear spacing of the splices, the edge splice condition, the amount of transverse reinforcement in the splice region, and the casting position. Cracking patterns, steel strain distributions, and failure modes of the specimens were studied to obtain a basic understanding of the behavior of lap splices in wide sections. GRA

N76-22614# Texas Univ., Austin. Center for Highway Research.
THE STRENGTH OF ANCHOR BARS: A REEVALUATION OF TEST DATA ON DEVELOPMENT LENGTH AND SPLICES Research Report
C. O. Orangun, James O. Jirsa, and John E. Breen Jan. 1975 90 p refs Prepared in cooperation with Texas Highway Dept.
(PB-248194/3; CFHR-3-5-72-154-3F; FHWA-RD-75-0422) Avail: NTIS HC $5.00 CSCL 13C

An equation was developed for calculating lengths of lap splices of deformed bars from a nonlinear regression analysis of test results of beams with lap splices. It reflects the effect of length, cover, spacing, bar diameter, concrete strength, transverse reinforcement, and moment gradient on the strength of lap splices. The equation is also applicable in determining basic development lengths. Based on the equation developed, design recommendations are proposed for development lengths and lap splices and compared with AASHTO Interim Specifications for Bridges, 1974. If cover is increased to 3 in. or transverse reinforcement is added, the splice length of large bars may be reduced by as much as 60 percent over that required by present AASHTO provisions. GRA

N76-22615# Texas Transportation Inst., College Station.
PAVEMENT EVALUATION. PHASE 1: PAVEMENT EVALUATION EQUIPMENT Final Report
Robert L. Lytton, William M. Moore, and Joe P. Mahoney Mar. 1975 275 p refs
(Contract DOT-FH-11-8264)
(PB-248621/5; FHWA-RD-75-78) Avail: NTIS HC $9.00 CSCL 13B

Determined were the most promising kinds of equipment to be developed for evaluating the structural condition of pavements. In order to decide what needed to be measured in determining the structural condition of a pavement, all 50 states, some Canadian provinces, and some city and county agencies were asked to name the factor they consider to be important in their assessment of pavement condition. Results of this survey of current pavement condition rating methods are included. The two most important variables were found to be stiffness and cracking. GRA

42 GEOSCIENCES (GENERAL)

N76-22616*# Tulane Univ., New Orleans, La.
EFFECTS OF ENVIRONMENTAL CHANGES ON MARSH VEGETATION WITH SPECIAL REFERENCE TO SALINITY Final Report, 1 Feb. 1975 - 31 Jan. 1976
Alfred E. Smalley and Leonard B. Thien 1 Feb. 1976 112 p refs
(Contract NAS9-14501)
(NASA-CR-147585) Avail: NTIS HC $5.50 CSCL 08J

A literature survey primarily concerned with brackish and salt marshes located along the eastern coast of North America and the Gulf Coast was presented. The review concentrated upon the vegetation of the marshes, particularly in regard to distribution, composition, succession, and productivity. Special efforts were made to include major works concerned with the Louisiana and Mississipi coastal marshes. It appears that spring to early summer (weeks 18-34 of the year; April - mid-July) is the best period of time to categorize the communities. It is during this time of the year that the communities appear most stable in regard to species composition. This allows a strong correlation to be drawn between the salinity of the region and the dominant species of the community. As such, this would seem to be best period in which to sample the marsh via air or land for differences in vegetation and salinity. Author

N76-22617# Committee on Interior and Insular Affairs (U. S. Senate).
OCEAN MANGANESE NODULES, SECOND EDITION
Washington GPO 1976 163 p refs Rept. for Comm. on Interior and Insular Affairs, 94th Congr., 2d Sess., Feb. 1976 Prepared by Library of Congr., Congressional Res. Service
(GPO-65-675) Avail: Comm. on Interior and Insular Affairs

Background information on deep seabed mining is presented, including the location of manganese nodule deposits, site evaluation, the technology involved, economic implications, commercial interests, government activities, international negotiations, and legislative history. The information is intended for use in the development of a national policy for deep seabed mining. D.M.L.

N76-22618# Wisconsin Univ., Madison. Inst. for Environmental Studies.
THE RESPONSE OF FLOODS AND SEDIMENT YIELDS TO CLIMATIC VARIATION AND LAND USE IN THE UPPER MISSISSIPPI VALLEY
J. C. Knox, P. J. Bartlein, K. K. Hirschboeck, and R. J. Muckenhirn Aug. 1975 78 p refs
(Grant NSF GI-29731)
(PB-247086/2; IES-52; NSF/RA/E-75-053) Avail: NTIS HC $5.00 CSCL 08H

Flooding and sediment yield responses are identified, described, and calibrated in terms of their interactions between climate systems and hydrologic systems. A major focus of the project was related to the impact of climatic variability as determined by patterns of upper atmospheric circulation. Attention was also devoted to the varying impacts of climate-hydrologic interactions as distributed over watersheds that differ according to size and land use. Six data sets to study interactions between climate systems and hydrologic systems as they impact floods and sediment yields in parts of the Upper Mississippi Valley were used. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N76-22619*# Central Treaty Organization, Ankara (Turkey).
REGIONAL INVESTIGATION OF TECTONIC AND IGNEOUS GEOLOGY IN IRAN, PAKISTAN AND TURKEY Quarterly Report

Morris Crawford, Principal Investigator 29 Jan. 1976 28 p refs Sponsored by NASA ERTS
(E76-10297; NASA-CR-146787; EC/24/M/D10; QR-1) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N76-22620*# Oregon State Univ., Corvallis.
RELATIONSHIPS BETWEEN VEGETATION AND TERRAIN VARIABLES IN SOUTHEASTERN ARIZONA Ph.D. Thesis
David A. Mouat, Principal Investigator Jun. 1974 258 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10299; NASA-CR-146792) Avail: NTIS HC $9.00 CSCL 08F

The author has identified the following significant results. Relationships were established between eight terrain variables and plant species and 31 vegetation types. Certain plant species are better than others for differentiating or discriminating groups of specified terrain variables. Certain terrain variables are better than others for differentiating or discriminating groups of vegetation types. Stepwise discriminant analysis was shown to be a useful tool in plant ecological studies.

N76-22621*# Oregon State Univ., Corvallis.
SMALL SCALE PHOTO PROBABILITY SAMPLING AND VEGETATION CLASSIFICATION IN SOUTHEAST ARIZONA AS AN ECOLOGICAL BASE FOR RESOURCE INVENTORY Ph.D. Thesis
James Russell Johnson, Principal Investigator 17 May 1974 205 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10301; NASA-CR-146794) Avail: NTIS HC $7.75 CSCL 08F

The author has identified the following significant results. The broad scale vegetation classification was developed for a 3,200 sq mile area in southeastern Arizona. The 31 vegetation types were derived from association tables which contained information taken at about 500 ground sites. The classification provided an information base that was suitable for use with small scale photography. A procedure was developed and tested for objectively comparing photo images. The procedure consisted of two parts, image groupability testing and image complexity testing. The Apollo and ERTS photos were compared for relative suitability as first stage stratification bases in two stage proportional probability sampling. High altitude photography was used in common at the second stage.

N76-22622*# Kentucky Dept. of Natural Resources and Environmental Protection, Frankfort.
[ENVIRONMENTAL EFFECTS OF STRIP MINING] Quarterly Progress Report, 21 May - 21 Aug. 1975
Birney R. Fish, Principal Investigator 21 Aug. 1975 3 p Sponsored by NASA ERTS
(E76-10303; NASA-CR-146808; QPR-2) Avail: NTIS HC $3.50 CSCL 08I

There are no author-identified significant results in this report.

N76-22623*# Commission of the European Communities, Ispra (Italy).
AGRICULTURAL RESOURCES INVESTIGATIONS IN NORTHERN ITALY AND SOUTHERN FRANCE (AGRESTE PROJECT). PART 1: ITALIAN TEST-SITES Progress Report, 15 Aug. - 15 Nov. 1975
Sergio Finzi, Principal Investigator 15 Nov. 1975 54 p refs Sponsored by NASA ERTS
(E76-10304; NASA-CR-146820; PR-1) Avail: NTIS HC $4.50 CSCL 02C

There are no author-identified significant results in this report.

N76-22624*# Commission of the European Communities, Ispra (Italy).
AGRESTE PROGRAM. PART 2: FRENCH TEST-SITES Quarterly Report, Dec. 1975 - Jan. 1976
Sergio Finzi, Principal Investigator Jan. 1976 92 p refs In ENGLISH; partly in FRENCH Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10305; NASA-CR-146822) Avail: NTIS HC $5.00 CSCL 02C

There are no author-identified significant results in this report.

N76-22625*# Dudley Observatory, Albany, N.Y.
S-149 MICROMETEORITE COLLECTION EXPERIMENT Final Report
Curtis L. Hemenway, Principal Investigator [1975] 50 p refs EREP
(Contract NAS9-10380)
(E76-10306; NASA-CR-147548) Avail: NTIS HC $4.00 CSCL 03B

There are no author-identified significant results in this report.

N76-22626*# Tri-State Regional Planning Commission, New York.
INVESTIGATION OF SKYLAB IMAGERY FOR REGIONAL PLANNING Final Report
William Harting, Principal Investigator Dec. 1975 39 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13266)
(E76-10308; NASA-CR-147562) Avail: NTIS HC $4.00 CSCL 05A

The author has identified the following significant results. It is feasible to use earth terrain camera imagery to detect four land uses (vacant land, developed land, streets, and water) for general regional planning purposes. Multispectral imagery is suitable for detecting, mapping, and measuring water bodies as small as two acres. Sufficient information can be extracted to prepare graphic and pictorial representations of the general growth and development patterns, but cannot be incorporated into an inventory file for predictive models.

N76-22627*# Minnesota State Planning Agency, St. Paul.
ANALYSIS OF DATA FOR LANDSAT (ERTS) FOLLOW-ON Progress Report, 26 Dec. 1975 - 25 Mar. 1976
Joseph E. Sizer, Principal Investigator 16 Apr. 1976 10 p ERTS
(Contract NAS5-20985)
(E76-10309; NASA-CR-146559) Avail: NTIS HC $3.50 CSCL 05B

There are no author-identified significant results in this report.

N76-22628*# Geological Survey, Miami, Fla.
SUBTROPICAL WATER-LEVEL DYNAMICS DISTRIBUTION Progress Report
A. L. Higer, Principal Investigator and L. J. Swayze Feb. 1976 3 p ERTS
(E76-10310; NASA-CR-146558) Avail: NTIS HC $3.50 CSCL 08F

There are no author-identified significant results in this report.

N76-22629*# Texas A&M Univ., College Station. Remote Sensing Center.
SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS Progress Report, Dec. 1975 - Feb. 1976
Bruce J. Blanchard, Principal Investigator Apr. 1976 15 p ERTS
(Contract NAS5-22534)
(E76-10311; NASA-CR-146824; RSC-3273-2) Avail: NTIS HC $3.50 CSCL 08H

There are no author-identified significant results in this report.

N76-22630*# Agricultural Research Service, Weslaco, Tex.
SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS Quarterly Progress Report, 13 Jan. - 13 Apr. 1976
Craig L. Wiegand, Harold W. Gausman, Ross W. Leamer, Arthur J. Richardson, James H. Everitt, and Alvin H. Gerbermann, Principal Investigators Apr. 1976 21 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-53876-AG)
(E76-10313; NASA-CR-146825) Avail: NTIS HC $3.50 CSCL 08F

The author has identified the following significant results. Software development for a computer-aided crop and soil survey system is nearing completion. Computer-aided variety classification accuracies using LANDSAT-1 MSS data for a 600 hectare citrus farm were 83% for Redblush grapefruit and 91% for oranges. These accuracies indicate that there is good potential for computer-aided inventories of grapefruit and orange citrus orchards with LANDSAT-type MSS data. Mean digital values of clouds differed statistically from those for crop, soil, and water entities, and those for cloud shadows were enough lower than sunlit crop and soil to be distinguishable. The standard errors of estimate for the calibration of computer compatible tape coordinate system (pixel and record) to earth coordinate system (longitude and latitude) for 6 LANDSAT scenes ranged from 0.72 to 1.50 pixels and from 0.58 to 1.75 records.

N76-22631*# California Univ., Berkeley. Space Sciences Lab.
USE OF SKYLAB IMAGERY TO ASSESS AND MONITOR CHANGE IN THE SOUTHERN CALIFORNIA ENVIRONMENT Final Report
R. N. Colwell, Leonard W. Bowden, Principal Investigators, James R. Huning, Claude W. Johnson, Charles F. Hutchinson, Anthony O. Clarke, and Robert M. Petersen 31 Dec. 1974 62 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-14420)
(E76-10315; NASA-CR-147561; SSL-Ser-17-Issue-5) Avail: NTIS HC $4.50 CSCL 08F

The author has identified the following significant results. The tectonic framework of the Salton Trough may be seen more clearly than ever before when viewed on Skylab imagery. Structural sketch maps were compiled from each frame of the imagery as photomaps delineating observable lineaments, many being extended beyond their prior ground-evaluated extremities. The study of the San Bernardino Mountains has shown that even by using high resolution Skylab imagery, surrogates must be developed in order to determine the relative age of the geomorphic surfaces which were studied. The most powerful surrogate for age determination was found to be reflectance. Reflectance was a function of age as indicated by the darkness of varnish; the older the surface the darker its signature. A test site at Ivanpah Dry Lake in eastern California was used to determine the environments that were to be isolated. Using the technique described by Tapper for density slice edge enhancement, transmittance values for four areas were extracted from the imagery using a microdensitometer. The silver masking technique of enhancement was used to maximize contrast between the designated entities and their surroundings. It was shown that Skylab imagery is exceedingly useful for assessment of ground water resources, both in terms of spatial distribution and behavior, in remote regions. Arid lands such as the south central Mojave Desert are most amenable to these techniques. The geohydrologic units within the study area are easily delineated by noting geohydrologic barriers such as drainage divides faults and lithologic contacts.

N76-22632# Committee on Interstate and Foreign Commerce (U. S. House).
NATURAL GAS SUPPLIES, VOLUME 1, PART 1
Washington GPO 1975 816 p refs Hearings before Subcomm. on Oversight and Investigations of Comm. on Interstate and Foreign Commerce, 94th Congr., 1st Sess., 9, 13, 26-27 Jun.; 14, 21 Jul. 1975
Avail: NTIS Avail: Subcom. on Oversight and Investigations

The accuracy of data supplied to the Federal Trade Association by the American Gas Association is considered. The possibility of underestimation of reserves and the formulation of cost of a wellhead are examined along with management decisions which might have adversely affected natural gas supplies. J.M.S.

N76-22633# Committee on Interstate and Foreign Commerce (U. S. House).
NATURAL GAS SUPPLIES, VOLUME 1, PART 2
Washington GPO 1975 986 p refs Hearings before Subcomm. on Oversight and Investigations of Comm. on Interstate and Foreign Commerce, 94th Congr., 1st Sess., 9, 13, 26-27 Jun.; 14, 21 Jul. 1975
(GPO-55-817) Avail: Subcomm. on Oversight and Investigations

For abstract, see N76-22632.

N76-22634*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT
Gary C. Thomann Jan. 1975 36 p refs
(NASA-TM-X-73049; ERL-M118) Avail: NTIS HC $4.00 CSCL 08J

An aircraft experiment was flown on November 7, 1973 to test a technique for remote water salinity measurement. Apparent temperatures at 21 cm and 8-14 micron wavelengths were recorded on eight runs over a line along which the salinity varied from 5 to 30%. Boat measurements were used for calibration and accuracy calculations. Overall RMS accuracy over the complete range of salinities was 3.6%. Overall RMS accuracy for salinities greater than 10%, where the technique is more sensitive, was 2.6%. Much of this error is believed to be due to inability to exactly locate boat and aircraft positions. The standard deviation over the eight runs for salinities > or = 10% is 1.4%; this error contains a component due to mislocation of the aircraft also. It is believed that operational use of the technique is possible with accuracies of 1-2%. Author

N76-22635*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
LANDSAT DATA FOR STATE PLANNING Annual Technical Report
N. L. Faust and G. W. Spann Dec. 1975 57 p refs
(Contract NAS8-30653)
(NASA-CR-144266) Avail: NTIS HC $4.50 CSCL 08B

The results of an effort to generate and apply automated classification of LANDSAT digital data to state of Georgia problems are presented. This phase centers on an analysis of the usefulness of LANDSAT digital data to provide land-use data for transportation planning. Hall County, Georgia was chosen as a test site because it is part of a seventeen county area for which the Georgia Department of Transportation is currently designing a Transportation Planning Land-Use Simulation Model. The land-cover information derived from this study was compared to several other existing sources of land-use data for Hall County and input into this simulation. The results indicate that there is difficulty comparing LANDSAT derived land-cover information with previous land-use information since the LANDSAT data are acquired on an acre by acre grid basis while all previous land-use surveys for Hall County used land-use data on a parcel basis. Author

N76-22636*# Mitre Corp., McLean, Va.
STRATOSPHERIC MEASUREMENT REQUIREMENTS AND SATELLITE-BORNE REMOTE SENSING CAPABILITIES
J. J. Carmichael, R. G. Eldridge, E. J. Frey, E. J. Friedman, and A. H. Ghovanlou Feb. 1976 223 p refs Sponsored by NASA
(Contract F19628-75-C-0001)
(NASA-CR-144911; MTR-7007) Avail: NTIS HC $7.75 CSCL 04A

The capabilities of specific NASA remote sensing systems to provide appropriate measurements of stratospheric parameters for potential user needs were assessed. This was used to evaluate the capabilities of the remote sensing systems to perform global monitoring of the stratosphere. The following conclusions were reached: (1) The performance of current remote stratospheric

sensors, in some cases, compares quite well with identified measurement requirements. Their ability to measure other species has not been demonstrated. (2) None of the current, in-situ methods have the capability to satisfy the requirements for global monitoring and the temporal constraints derived from the users needs portion of the study. (3) Existing, non-remote techniques will continue to play an important role in stratospheric investigations for both corroboration of remotely collected data and in the evolutionary development of future remote sensors. Author

N76-22637*# Old Dominion Univ. Research Foundation, Norfolk, Va.
RETRIEVAL OF SURFACE TEMPERATURE BY REMOTE SENSING
S. K. Gupta (Old Dominion Univ.) and S. N. Tiwari (Old Dominion Univ.) Apr. 1976 42 p refs
(Grant NsG-1153)
(NASA-CR-147145; TR-76-1T8) Avail: NTIS HC $4.00 CSCL 04A

A simple procedure and computer program were developed for retrieving the surface temperature from the measurement of upwelling infrared radiance in a single spectral region in the atmosphere. The program evaluates the total upwelling radiance at any altitude in the region of the CO fundamental band (2070-2220 1/cm) for several values of surface temperature. Actual surface temperature is inferred by interpolation of the measured upwelling radiance between the computed values of radiance for the same altitude. Sensitivity calculations were made to determine the effect of uncertainty in various surface, atmospheric and experimental parameters on the inferred value of surface temperature. It is found that the uncertainties in water vapor concentration and surface emittance are the most important factors affecting the accuracy of the inferred value of surface temperature. Author

N76-22638*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE SOLUTION OF PROBLEMS IN THE MANAGEMENT OF RESOURCES IN INDIANA Semiannual Status Report, 1 Jun. - 30 Nov. 1975
R. A. Weismiller 1975 78 p refs
(Grant NGL-15-005-186)
Avail: NTIS HC $5.00 CSCL 05A

Several projects which initiated in Indiana to evaluate the utility of remote sensing in resources management are described. Areas of application included highway route selection, power plant siting, water resources evaluation, the location of gravel, soil inventory and forest managment. The utilization of digital techniques is also discussed. D.M.L.

N76-22639*# South Dakota State Univ., Brookings. Remote Sensing Institute.
APPLICATION OF REMOTE SENSING TECHNOLOGY TO LAND EVALUATION, PLANNING UTILIZATION OF LAND RESOURCES, AND ASSESSMENT OF WILDLIFE AREAS IN EASTERN SOUTH DAKOTA Semiannual Progress Report, 1 Jul. - 31 Dec. 1975
1975 38 p refs
(Grant NGL-42-003-007)
(NASA-CR-147110; SDSU-RSI-76-02) Avail: NTIS HC $4.00 CSCL 05A

A soils map for land evaluation in Potter County (Eastern South Dakota) was developed to demonstrate the use of remote sensing technology in the area of diverse parent materials and topography. General land use and soils maps have also been developed for land planning LANDSAT, RB-57 imagery, and USGS photographs are being evaluated for making soils and land use maps. LANDSAT fulfilled the requirements for general land use and a general soils map. RB-57 imagery supplemented by large scale black and white stereo coverage was required to provide the detail needed for the final soils map for land evaluation. Color infrared prints excelled black and white coverage for this soil mapping effort. An identification and classification key for wetland types in the Lake Dakota Plain was developed for June 1975 using color infrared imagery. Wetland types in the region are now being mapped via remote sensing techniques to provide a current inventory for development of mitigation measures. Author

N76-22640*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
LEGAL ASPECTS OF SATELLITE ESTIMATION, CONSERVATION AND DEVELOPMENT OF EARTH RESOURCES
Giovanni Meloni Washington NASA Apr. 1976 14 p refs Transl. into ENGLISH from the book "Colloquium on the Law of Outer Space, 15th, Vienna, Austria, October 8-15, 1972, Proceedings" Hackensack, N. J., Fred B. Rothman and Co., 1973 p 38-44
(Contract NASw-2789)
(NASA-TT-F-16991) Avail: NTIS HC $3.50 CSCL 05D

The harmonization of the national interest of individual nations with the common interest of mankind as a whole in the utilization of space for such peaceful purposes as the survey, conservation, and development of earth resources is discussed. Special attention is given to the possibilities and limitations of international control of such space activities by United Nations organs. Author

N76-22641*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
USE OF SATELLITES IN THE STUDY OF TROPICAL VEGETATION
M. Soto, A. Gomez-Pompa, F. Menendez, and G. Arp Washington NASA Mar. 1976 11 p refs Transl. into ENGLISH of "Uso de los Satelites en el Estudio de la Vegetacion Tropical" (unpublished report), Mexico City, Mexico Univ., 1976 8 p
(Contract NASw-2789)
(NASA-TT-F-16941) Avail: NTIS HC $3.50 CSCL 08F

Potential vegetation and actual vegetation maps are compared. For the study of Veracruz, a map combining these types as well as the various methods normally used was attempted. Data used for the study came from the MSS of the ERTS 1 satellite. From these, grey maps of the different radiances of the area were obtained, as well as isoclass programs. The latter were found to have the best results. Though much research still needs to be done, first results indicate that this methodology can revolutionize all the concepts and methods of evaluation and inventory of terrestrial vegetation resources. Author

N76-22642*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
ON THE ACCESS TO AN EARTH RESOURCES DATA PROCESSING SYSTEM
Terry L. Phillips and Susan K. Schwingendorf 1974 24 p
(Grant NGL-15-005-112)
(NASA-CR-147139; LARS-IN-031274) Avail: NTIS HC $3.50 CSCL 05B

The Purdue/LARS earth resources data processing system is briefly described. The considerations to which an organization would want to give attention before obtaining a remote terminal to this system are discussed. The support of such a terminal which Purdue/LARS is willing to propose is described. Author

N76-22643*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
AAFE RADSCAT DATA REDUCTION PROGRAMS USER'S GUIDE
John P. Claassen 1976 146 p refs
(Contract NAS1-10048)
(NASA-CR-144992; CRES-TR-186-9) Avail: NTIS HC $6.00 CSCL 04B

Theory, design and operation of the computer programs which automate the reduction of joint radiometer and scatterometer observations are presented. The programs raduce scatterometer measurements to the normalized scattering coefficient; whereas the radiometer measurements are converted into antenna temperatures. The programs are both investigator and user oriented. Supplementary parameters are provided to aid in the interpretation of the observations. A hierarchy of diagnostics is available to evaluate the operation of the instrument, the conduct of the experiments and the quality of the records. General descriptions of the programs and their data products are also presented. This document therefore serves as a user's guide to the programs and is therefore intended to serve both the experimenter and the program operator. Author

N76-22644# Technische Universitaet, Brunswick (West Germany). Inst. fuer Geophysik und Meteorologie.
GEOMAGNETIC MEASUREMENTS OF BASALT OCCURRENCE IN SALT STOCK AT ROLFSBUETTEL [GEOMAGNETISCHE MESSUNGEN AM BASALTVORKOMMEN DES SALZSTOCKES VON ROLFSBUETTEL]
K.-H. Nauwald and U. Hunsche 1975 51 p refs In GERMAN
(GAMMA-27) Avail: NTIS HC $4.50

Measurements were carried out of geomagnetic field anomalies above a foreign body embedded in a salt stock near Rolfsbuettel (Germany). The result is an extended, closed, north-south, positive anomaly between two basalt drill holes, indicating a basalt duct at an average maximum depth of 55 m. Model calculations confirm the results of the measurements. ESA

N76-22645# Delft Hydraulics Lab. (Netherlands).
A MORPHOLOGICAL TIME-SCALE FOR RIVERS
M. DeVries Nov. 1975 9 p refs Presented at the 16th Intern. Assoc. for Hydraulic Res. Congr., Sao Paulo, Brazil, Jul. 1975
(Publ-147) Avail: NTIS HC $3.50

To predict changes in the geometry of a river due to human interference, a morphological time-scale, characterizing processes of degradation (erosion) and aggradation of rivers was defined. Processes of degradation and aggradation of rivers have a speed depending on the characteristics of the river. Starting from the basic transport equation containing the time-depending transport coefficient, a morphological time-scale was established and estimated for various rivers such as the Rhine, the Magdalena (Columbia), the Danube (Hungary), the Tana (Kenya), and the Apure (Venezuela). ESA

N76-22646# Delft Hydraulics Lab. (Netherlands).
COMPUTATIONAL ANALYSIS FOR OPTIMAL BOUNDARY CONTROL OF TWO-DIMENSIONAL TIDAL MODEL
P. VanDerKuur and G. K. Verboom Nov. 1975 9 p refs Presented at the 16th Intern. Assoc. for Hydraulic Res. Congr., Sao Paulo, Brazil, Jul. 1975
(Publ-148) Avail: NTIS HC $3.50

In order to supply data for the water management of the Rotterdam Waterway Estuary and to investigate an optimum sea boundary control system, various mathematical models describing the tidal propagation are presented and discussed. They include the one- and two-dimensional analytical models and the two-dimensional numerical model. Results of these mathematical models were in agreement. Further investigations with the numerical model were carried out to find ways to adjust this model to satisfy a good water level and a reasonable horizontal tide seawards of Hook of Holland. ESA

N76-22647# Delft Hydraulics Lab. (Netherlands).
EXPERIMENTAL RESULTS ON EXCHANGE COEFFICIENTS FOR NON-HOMOGENEOUS FLOW
A. J. VanRees Nov. 1975 12 p refs Presented at the 16th Intern. Assoc. for Hydraulic Res. Congr., Sao Paulo, Brazil, Jul. 1975
(Publ-150) Avail: NTIS HC $3.50

To get an insight into the salinity intrusion phenomena in the Rotterdam Waterway Estuary, a research program on density currents is being carried out in a tidal flume. Data from a series of tests were evaluated on the basis of a two-dimensional analysis, applied for control volumes in a detailed sampling system. As a result, the distribution of the turbulent exchange of mass and momentum could be determined. These quantities were analyzed in detail on the basis of some relevant theories, e.g. diffusion and mixing length theories. Attempts were made to correlate the physical quantities used in these theories with parameters related to the geometry and the flow conditions. Author (ESA)

N76-22648# Delft Hydraulics Lab. (Netherlands).
COMPUTATION OF VELOCITY PROFILES IN SCOUR HOLES
H. N. C. Breusers Nov. 1975 10 p refs Presented at the 16th Intern. Assoc. for Hydraulic Res. Congr., Sao Paulo, Brazil, Jul. 1975
(Publ-152) Avail: NTIS HC $3.50

The applicability of the Reichardt free turbulent shear flow method to predict velocity profiles in scour holes was investigated. A numerical solution of the resulting equation in a boundary flow is presented. Results are compared with experimental results. It is shown that the method gives an approximate description of the velocity distribution in a scour hole. It may, however, be used to compare the effect of various initial velocity profiles and to compute the final equilibrium shape of the scour hole. If a relation is established between the bed velocity and local sediment transport it can also be used to compute the development of scour holes. ESA

N76-22649# Delft Hydraulics Lab. (Netherlands). Lab. de Voorst.
HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS. SCOPE OF MATHEMATICAL MODELS
C. B. Vreugdenhil and J. Voogt (Rijkswaterstaat) Dec. 1975 21 p refs Presented at the Am. Soc. of Civil Engr. Symp. Modeling 75, San Francisco, 3-5 Sep. 1975
(Publ-155) Avail: NTIS HC $3.50

An analysis is given of the assumptions in different types of models. The starting-point is formed by the equations for three-dimensional turbulent flow. An estimate of the importance of various terms is given. By several averaging processes, increasingly simpler models are obtained, but the interpretation of coefficients becomes increasingly more difficult. Also the numerical possibilities are discussed, with special emphasis on aspects of accuracy and nonlinear stability, which are considered the most important numerical problems. Attention is limited to nearly horizontal flow, although the influence of short waves on these flows is also treated. In the discussion the parallel between momentum and mass transfer (hydrodynamics and water quality) is taken into account. Author (ESA)

N76-22650# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CAST STUDY NO. 12: OUTER CONTINENTAL SHELF OIL AND GAS
D. E. Kash and I. L. White 1975 33 p Prepared in cooperation with Oklahoma Univ., Norman
(Contract NSF C-927)
(PB-247256/1; NSF/RA/G-75-040) Avail: NTIS HC $4.00 Also included in complete report and summary PB-247243, HC $13.00 CSCL 08I

This University of Oklahoma study of outer continental shelf (OCS) oil and gas operations was, at the time of its completion, the only comprehensive and disinterested study of both OCS oil and gas extraction technologies and government regulatory and management policies relating to those operations. The final report includes specific policy recommendations that were incorporated almost verbatim into several pieces of proposed federal legislation. The study has also accounted for the reshaping of several current policies and procedures of the agencies that control OCS leasing and management. This report briefly discusses the study and utilization of its results. GRA

N76-22651# Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
ATLANTIC OUTER CONTINENTAL SHELF ENERGY RESOURCES: ECONOMIC IMPLICATIONS FOR LONG ISLAND
Robert J. Kalter and Wallace E. Tyner Apr. 1975 84 p refs Sponsored by NOAA
(PB-246963/3; NOAA-75102404) Avail: NTIS HC $5.00 CSCL 05C

The following topics are discussed: the Atlantic outer continental shelf and its geology, potential reserves, production costs, and leasing possibilities; economic and social impacts; and effects of information constraints. Author

N76-22652# Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.
A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 6
Daniel P. Loucks Sep. 1975 484 p

(PB-247098/7; OWRT/WRSIC-75-201-Vol-6; W76-01517) Avail: NTIS HC $12.50 CSCL 13B

An annotated bibliography consisting of 301 abstracts of selected publications issued in 1973 and 1974 is presented. The bibliography to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. The abstracted material emphasizes the application of optimization and simulation techniques for assisting the planning and management of water resource systems. GRA

N76-22653# Georgia Univ., Athens. Environmental Resources Center.

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS Technical Completion Report

Bernard W. Taylor, III and Ronald M. North Sep. 1975 86 p refs

(Contract DI-14-31-0001-4010)

(PB-247114/2; ERC-1375; W76-01510; OWRT-A-052-GA(1)) Avail: NTIS HC $5.00 CSCL 13B

The existing economic criteria for evaluating water resource projects are deterministic and therefore incomplete since these criteria do not include any consideration of uncertainty of possible outcomes. A Monte Carlo simulation approach was used to generate values for a mean and a standard deviation for the benefits, costs, benefit-cost ratios and net present values for the Spewrell Bluff Project in Georgia to demonstrate the variability of probable outcomes from investing public funds in the project. A triangular distribution of most likely, most optimistic, and most pessimistic estimates of project managers within the Corps of Engineers formed the basis for the simulation. GRA

N76-22654# American Society of Civil Engineers, New York.

PROCEEDINGS OF THE CONFERENCE ON INTERDISCIPLINARY ANALYSIS OF WATER RESOURCE SYSTEMS

J. Ernest Flack 1975 421 p refs Conf. held at Boulder, Colo., 19-22 Jun. 1973

(Contract DI-14-31-0001-3757)

(PB-248596/9; W76-03005; OWRT-X-126(3757)(1)) Avail: NTIS HC $11.00 CSCL 13B

The Water Resources Systems Committee of the American Society of Civil Engineers; Technical Council on Water Resources Planning and Management saw a critical need for developing an interdisciplinary approach to water resources development. Formal papers on six interdisciplinary efforts were selected as case studies, around which discussions were built. These six papers include interdisciplinary studies on: (1) large reservoirs in Africa; (2) limnological modeling of the Great Lakes; (3) geothermal development; (4) the North Atlantic Regional Water Resources Study: (5) Corps of engineers planning experience in the St. Louis-Maline Creek; and (6) University research in the Wisconsin River and the Lower Fraser River (Brit. Columbia) water quality studies. Discussions are given after each paper. Included also is an introductory article on the interdisciplinary aspects of water resources planning and management. GRA

N76-22655# Utah Water Research Lab., Logan.

REGIONAL DEVELOPMENT: AN ECONOMETRIC STUDY OF THE ROLE OF WATER DEVELOPMENT IN EFFECTUATING POPULATION AND INCOME CHANGES

Herbert H. Fullerton, W. Cris Lewis, Jay C. Andersen, John E. Keith, and Reed Willis Jun. 1975 59 p refs

(Contract DI-14-31-0001-4131)

(PB-248711/4; PRRBE089-1; W76-03137; OWRT-B-080-UTAH(1)) Avail: NTIS HC $4.50 CSCL 13B

Twelve measures of regional economic growth, including population and three measures of income were compared for areas with and without water investment in 246 counties and 42 water resource subareas in the states of Utah, Colorado, New Mexico, Montana, Wyoming, Idaho, and Nevada. For some areas where more detailed records of water investment were available, a nine equation econometric model was estimated using three-stage least squares analysis. It was found that total gross output attributable to projects ranged from zero in the petroleum and mining sectors to a high of 260,302 in the dairy industry. Other findings are also discussed. GRA

N76-23084* Smithsonian Institution, Washington, D.C. National Air and Space Museum.

EARTH OBSERVATIONS AND PHOTOGRAPHY EXPERIMENT MA-136

Farouk El-Baz and D. A. Mitchell *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 64 p refs (For availability see N76-23074 13-88)

CSCL 08E

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N76-22656 California Univ., Irvine.

OPTIMIZATION OF US ENERGY POLICY: OBJECTIVES AND ALTERNATIVES Ph.D. Thesis

Timothy Jordanides 1975 149 p

Avail: Univ. Microfilms Order No. 76-7234

A nonlinear dynamic model for petroleum utilization in the United States is developed. The structural formulation of the model is based upon the system dynamics approach taking into account both economic and geologic considerations. The emphasis is placed on portraying the nonlinear, feedback, and time lag character of energy usage. The final model is in state-variable form as a system of simultaneous, nonlinear, dynamic, discrete-time, difference equations. There are six state variables; domestic supply; inventory; capital investment for the production, exploration and refining of petroleum; capital investment for research and development of new soruces of energy; substitution fraction; and domestic supply rate. There are two exogenous inputs: population and import supply rate. The need for realistic control (policy) variables is shown in contrast to the predominance of price in previous energy models. Dissert. Abstr.

N76-22657* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SOLAR ENERGY ABSORBER Patent

Lott W. Brantley, Jr., inventor (to NASA) Issued 20 Apr. 1976 6 p Filed 29 Oct. 1974 Supersedes N75-10585 (13 - 01, p 0076)

(NASA-Case-MFS-22743-1; US-Patent-3,951,129; US-Patent-Appl-SN-518684; US-Patent-Class-126-271) Avail: US Patent Office CSCL 10A

A solar energy absorber is described, which includes a tubular absorber surface through which a fluid passes for transferring thermal energy from the absorber to other devices. Positioned above the tubular absorber surface are spaced glass layers. Positioned between an upper layer and the next layer is a vacuum, or air for minimizing thermal energy losses through convection. A clear liquid passes between two intermediate layers of glass for transferring the thermal energy absorbed by either the initial passage of the visible spectrum of electromagnetic rays or by infrared radiation from an absorber positioned below. Official Gazette of the U.S. Patent Office

N76-22658 Syracuse Univ., N.Y.

HETEROJUNCTION SOLAR CELLS Ph.D. Thesis

Stephen Wai-Yan Lai 1975 155 p

Avail: Univ. Microfilms Order No. 76-7661

Two new types of heterojunction cells have been investigated for photovoltaic conversion. Each type consists of a Si substrate and a window layer which serves the triple purpose of being a transparent contact, providing an antireflection coating, and forming the junction barrier in the Si. Each type of cell was fabricated using low temperature processing. It is concluded that the concept of a heterojunction solar cell using a transparent semiconductor as window is valid. The limitation on efficiency

of these heterojunction cells is primarily due to the substrate minority carrier band edge discontinuity at the interface.
Dissert. Abstr.

N76-22659 Oklahoma Univ., Norman.
ECONOMIC OPTIMIZATION MODELS OF WIND POWER SYSTEMS Ph.D. Thesis
Hee Man Bae 1975 193 p
Avail: Univ. Microfilms Order No. 76-8321

Models for the economic optimum design of large scale windpower systems were developed including systems without storage and systems with storage. The objective of the models is to maximize the total net value of electricity generated under assumed operating rules for the windpower systems and general conditions regarding wind speed and demand variations. In the model for windpower systems without storage, optimization is carried out with respect to the total capacity of windturbines that vary in the values of design parameters such as rotor diameter, tower height and wind speed at which maximum power is generated. The model for windpower systems with storage was developed for the case in which the average wind speeds in successive time increments show very low correlation. The model is then modified for the case of low serial correlation. An analytical storage model is used as a basis of representing storage requirements for a given system. Dissert. Abstr.

N76-22660 Oregon State Univ., Corvallis.
DETERMINANTS OF ELECTRICAL ENERGY DEMAND FOR A STATE, METHODOLOGY AND SYSTEM SIMULATION Ph.D. Thesis
Warren Downe Devine, Jr. 1976 277 p
Avail: Univ. Microfilms Order No. 76-7745

The determinants of electrical energy demand for the State of Oregon are represented in a mathematical model. This model is structured to operate in parallel with a computer simulation model of the state and is utilized independently to investigate electrical energy consumption during various scenarios of economic activity and energy prices. Alternate methodologies used in forecasting are reviewed. It is argued that the determinants of electricity demand should be viewed as interrelated elements of a socio-economic system and must be addressed in concert with one another. The Oregon State Simulation Model (OSSIM) and the system simulation methodology employed in its development are described. The data base, structure, and dynamics of the electrical energy demand model are presented.
Dissert. Abstr.

N76-22661*# Globe-Union, Inc., El Monte, Calif.
PRODUCTION AND DELIVERY OF VIOLET SOLAR CELLS Final Report
[1974] 37 p ref
(Contract NAS8-29872)
(NASA-CR-144250) Avail: NTIS HC $4.00 CSCL 10A

The expansion of conventional violet cells from laboratory numbers to pilot line numbers is described. The basic properties of a violet cell are discussed. The close interaction of all the process steps is emphasized. Author

N76-22662*# Battelle Columbus Labs., Ohio.
INVESTIGATION OF STORAGE SYSTEM DESIGNS AND TECHNIQUES FOR OPTIMIZING ENERGY CONSERVATION IN INTEGRATED UTILITY SYSTEMS. VOLUME 1: (EXECUTIVE SUMMARY) Final Report
10 Mar. 1976 30 p refs 3 Vol.
(Contract NAS9-14628)
(NASA-CR-147591) Avail: NTIS HC $4.00 CSCL 10C

Integrated Utility Systems (IUS) have been suggested as a means of reducing the cost and conserving the nonrenewable energy resources required to supply utility services (energy, water, and waste disposal) to developments of limited size. The potential for further improving the performance and reducing the cost of IUS installations through the use of energy storage devices is examined and the results are summarized. Candidate energy storage concepts in the general areas of thermal, inertial, superconducting magnetic, electrochemical, chemical, and compressed air energy storage are assessed and the storage of thermal energy as the sensible heat of water is selected as the primary candidate for near term application to IUS. Author

N76-22663*# Battelle Columbus Labs., Ohio.
INVESTIGATION OF STORAGE SYSTEM DESIGNS AND TECHNIQUES FOR OPTIMIZING ENERGY CONSERVATION IN INTEGRATED UTILITY SYSTEMS. VOLUME 2: (APPLICATION OF ENERGY STORAGE TO IUS) Final Report
10 Mar. 1976 120 p refs 3 Vol.
(Contract NAS9-14628)
(NASA-CR-147592) Avail: NTIS HC $5.50 CSCL 10C

The applicability of energy storage devices to any energy system depends on the performance and cost characteristics of the larger basic system. A comparative assessment of energy storage alternatives for application to IUS which addresses the systems aspects of the overall installation is described. Factors considered include: (1) descriptions of the two no-storage IUS baselines utilized as yardsticks for comparison throughout the study; (2) discussions of the assessment criteria and the selection framework employed; (3) a summary of the rationale utilized in selecting water storage as the primary energy storage candidate for near term application to IUS; (4) discussion of the integration aspects of water storage systems; and (5) an assessment of IUS with water storage in alternative climates. Author

N76-22664*# Battelle Columbus Labs., Ohio.
INVESTIGATION OF STORAGE SYSTEM DESIGNS AND TECHNIQUES FOR OPTIMIZING ENERGY CONSERVATION IN INTEGRATED UTILITY SYSTEMS. VOLUME 3: (ASSESSMENT OF TECHNICAL AND COST CHARACTERISTICS OF CANDIDATE IUS ENERGY STORAGE DEVICES) Final Report
10 Mar. 1976 244 p refs 3 Vol.
(Contract NAS9-14628)
(NASA-CR-147593) Avail: NTIS HC $8.00 CSCL 10C

Six energy storage technologies (inertial, superconducting magnetic, electrochemical, chemical, compressed air, and thermal) were assessed and evaluated for specific applicability to the IUS. To provide a perspective for the individual storage technologies, a brief outline of the general nature of energy storage and its significance to the user is presented. Author

N76-22665*# TRW Systems Group, Redondo Beach, Calif.
A STUDY OF GEOTHERMAL PROSPECTS IN THE WESTERN UNITED STATES Final Report
20 Aug. 1975 147 p refs
(Contracts NAS7-100; JPL-954243)
(NASA-CR-147114; TRW-28455-6001-RU-00) Avail: NTIS HC $6.00 CSCL 10B

The commercial development potential of 13 underdeveloped geothermal prospects in the western United States was examined and the prospects were ranked in order of relative potential for development on the basis of investment considerations. The following were considered in the ranking: geotechnical and engineering data, energy market accessibility, administrative constraints, and environmental and socio-economic factors. The Roosevelt, Utah, prospect ranks first in development potential followed in order by Beowawe, Nevada; Coso Hot Springs, California; Long Valley, California; and Brady's Hot Springs, Nevada. Author

N76-22666*# General Electric Co., Philadelphia, Pa.
FEASIBILITY STUDY OF A 200 WATT PER KILOGRAM LIGHTWEIGHT SOLAR ARRAY SYSTEM Quarterly Report, 19 Jan. - 31 Mar. 1976
R. Stanhouse, J. Cokonis, and G. Rayl 15 Apr. 1976 144 p refs Prepared for JPL
(Contracts NAS7-100; JPL-954393)
(NASA-CR-146878; Doc-76SDS54214) Avail: NTIS HC $6.00 CSCL 10A

Progress in an investigation of the feasibility of designing a lightweight solar array with a power-to-weight ratio of 200 watts per kilogram is described. This solar array will produce 10,000 watts of electrical power at 1 A.U. at its beginning of life (BOL), and degrade less than 20% over a three year period in interplanetary flight. A review of existing lightweight solar array system concepts is presented along with discussion pertaining to their applicable technology as it relates to a 200 watt/kilogram array. Also presented is a discussion of the candidate development solar cells being considered, and various deployable boom concepts under investigation. Author

N76-22667*# Texas Instruments, Inc., Dallas.
AUTOMATED ARRAY ASSEMBLY TASK, PHASE 1 Quarterly Report
Bernard G. Carbajal and Samuel V. Rea Mar. 1976 31 p
Prepared for JPL Sponsored by ERDA
(Contract NAS7-100; JPL-954405)
(NASA-CR-147165; QR-1; TI-03-76-13;
ERDA/JPL-954405-76/954405-7-5) Avail: NTIS HC $4.00
CSCL 10A

Work consisted primarily of preparing base line cost estimates for current solar cell processing technologies; preparing an initial design-to-cost goal breakdown; designing and beginning construction of an experimental solar cell module; and initiating the various activities that make up this task. The base line cost estimates show that current solar cell fabrication technology is about an order of magnitude too expensive as compared to the design-to-cost goals. In the area of solar cell fabrication, metallization is shown to be the least cost-effective process element. Author.

N76-22668*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SUMMARY OF THE ECAS PERFORMANCE AND COST RESULTS FOR MHD SYSTEMS
G. R. Seikel, R. J. Sovie, R. K. Burns, G. J. Barna, J. A. Burkhart, J. J. Nainiger, and J. M. Smith 1976 22 p refs Proposed for presentation at the Fifteenth Symp. on the Eng. Aspects of Magnetohydrodynamics, Philadelphia, 24-26 May 1976
(NASA-TM-X-71913) Avail: NTIS HC $3.50 CSCL 10B

The potential is examined of various advanced power plant concepts using coal and coal-derived fuel. The results indicate that open cycle coal fired direct preheat MHD systems have potentially one of the highest coal-pile-to-bus-bar efficiencies and also one of the lowest costs of electricity (COE) of the systems studied. Closed cycle MHD systems may have the potential to approach the efficiency and COE of open cycle MHD. The 1200-1500 F liquid metal MHD systems studied do not appear to have the potential of exceeding the efficiency or competing with the COE of advanced steam plants. Author

N76-22669# Select Committee on Small Business (U. S. House).
ENERGY DATA REQUIREMENTS OF THE FEDERAL GOVERNMENT. PART 2: OIL SHALE
Washington GPO 1974 145 p refs Hearing before Subcomm. on Activities of Regulatory Agencies of Permanent Select Comm. on Small Business, 93d Congr., 2d Sess., 28 Jan. 1974
(GPO-32-466) Avail: Subcomm. on Activities of Regulatory Agencies

The information and evaluation techniques by which the Department of the Interior determines the value of land leased in the oil shale program are examined. Recommendations are included. J.M.S.

N76-22670# Committee on Foreign Affairs (U. S. House).
THE ENERGY CRISIS: IMPACT ON DEVELOPMENT IN LATIN AMERICA AND THE CARIBBEAN
Washington GPO 1974 43 p Hearing before Subcomm. on Inter-American Affairs of Comm. on Foreign Affairs, 93d Congr., 2d Sess., 27 Mar. 1974
(GPO-34-468) Avail: Subcomm. on Inter-American Affairs

The impact of the energy crisis on Latin America and the Caribbean is discussed. Factors considered include: decreasing energy and food supply, economic recession, and an accelerated power shift. J.M.S.

N76-22671*# Chamberlain Corp., Waterloo, Iowa. Research and Development Div.
DESIGN, FABRICATION, TESTING AND DELIVERY OF A SOLAR COLLECTOR Final Report
William H. Sims, Robert W. Ballheim, Stephen M. Bartley, and Gregory W. Smith Jan. 1976 231 p refs
(Contract NAS8-31326)
(NASA-CR-144265; C8092-PR-012) Avail: NTIS HC $8.00
CSCL 10A

A two phase program encompassing the redesign and fabrication of a solar collector which is low in cost and aesthetically appealing is described. Phase one work reviewed the current collector design and developed a low-cost design based on specific design/performance/cost requirements. Throughout this phase selected collector component materials were evaluated by testing and by considering cost, installation, maintainability and durability. The resultant collector design was composed of an absorber plate, insulation, frame, cover, desiccant and sealant. In Phase two, three collector prototypes were fabricated and evaluated for both nonthermal and thermal characteristics. Tests included static load tests of covers, burst pressure tests of absorber plates, and tests for optical characteristics of selective absorber plate coatings. The three prototype collectors were shipped to Marshall Space Flight Center for use in their solar heating and cooling test facility. Author

N76-22672*# ECON, Inc., Princeton, N.J.
SPACE-BASED SOLAR POWER CONVERSION AND DELIVERY SYSTEMS STUDY Interim Summary Report
31 Mar. 1976 262 p refs
(Contract NAS8-31308)
(NASA-CR-144289; Rept-76-145-IB) Avail: NTIS HC $9.00
CSCL 10A

Even at reduced rates of growth, the demand for electric power is expected to more than triple between now and 1995, and to triple again over the period 1995-2020. Without the development of new power sources and advanced transmission technologies, it may not be possible to supply electric energy at prices that are conductive to generalized economic welfare. Solar power is renewable and its conversion and transmission from space may be advantageous. The goal of this study is to assess the economic merit of space-based photovoltaic systems for power generation and a power relay satellite for power transmission. In this study, satellite solar power generation and transmission systems, as represented by current configurations of the Satellite Solar Station (SSPS) and the Power Relay Satellite (PRS), are compared with current and future terrestrial power generation and transmission systems to determine their technical and economic suitability for meeting power demands in the period of 1990 and beyond while meeting ever-increasing environmental and social constraints. Author

N76-22673# Committee on Finance (U. S. Senate).
ENERGY CONSERVATION AND CONVERSION ACT OF 1975, PART 1
Washington GPO 1975 464 p refs Hearings on H.R. 6860 before Comm. on Finance, 94th Congr., 1st Sess., 10, 11, 14-17 and 18 Jul. 1975
(GPO-55-583) Avail: SOD HC $3.95

An act to provide a national energy conservation and conversion program is presented. Factors considered include: import oil-quotas, duties, and restrictions; automobile fuel milage; intercity buses, radial tires, and rerefined oil; tax incentives for energy related improvements of buildings; and an energy conservation and conversion trust fund. J.M.S.

N76-22674# Committee on Government Operations (U. S. Senate).
OVERSIGHT OF ENERGY CONSERVATION
Washington GPO 1975 974 p refs Hearings before Comm. on Govt. Operations, 94th Congr., 1st Sess., 16-18 Apr. 1975
(GPO-55-035) Avail: SOD HC $7.50

Energy conservation measures adopted in the industrial, commercial, residential, transportation, and government sectors of the economy are discussed. Economic factors and energy shortages are considered in terms of voluntary measures vs. mandatory programs. J.M.S.

N76-22675# Sandia Labs., Livermore, Calif.
SOLAR ABSORPTANCE OF A SEMI-TRANSPARENT LAYER ON AN OPAQUE SUBSTRATE
M. Abrams Sep. 1975 50 p refs
(Contract AT(29-1)-789)
(SAND-75-8041) Avail: NTIS HC $4.00

In one of the solar energy systems, solar energy is absorbed in a molten layer of a semitransparent salt which flows over an opaque substrate. A theoretical model for the effective solar absorptance of the layer-substrate system was developed, and predictions of the model are discussed. The effective absorptance is found to depend strongly upon the direction of the incident beam of radiation for large angles of incidence. It is concluded

that effective absorptance can be significantly increased by introducing a suspension of absorbing particles within the layer, or by reducing the substrate reflectance. Author (ERA)

N76-22676# Sandia Labs., Albuquerque, N.Mex.
APPROACHES TO FABRICATION OF PARABOLIC TROUGH REFLECTORS
R. L. Champion [1975] 18 p Presented at the Natl. SAMPE Tech. Conf., Albuquerque, N. Mex., 14 Oct. 1975 Sponsored by ERDA
(SAND-75-5879; Conf-751005-15) Avail: NTIS HC $4.00

Design of parabolic trough reflectors for focusing solar collectors must consider a large number of applicable parameters. Cost of materials, fabrication, and installation is one of the most important. Design concepts which offer potential for low-cost mass production include honeycomb/stressed skin structures, molded plywood, stretch-formed metal skins, and rigid foams. Author (ERA)

N76-22677# Sandia Labs., Albuquerque, N.Mex. Aerodynamics Project Dept.
SOME GEOMETRICAL ASPECTS OF TROPOSKIENS AS APPLIED TO VERTICAL-AXIS WIND TURBINES
B. F. Blackwell and G. E. Reis May 1975 47 p refs Sponsored by ERDA
(SAND-74-0177) Avail: NTIS HC $4.00

Several geometric ratios connected with the troposkien (the shape a completely flexible cable assumes when it is spun at a constant angular velocity about a vertical axis to which its two ends are attached) are derived analytically. The results are evaluated for several values of the ratio of the maximum radial displacement to half the spacing between the attachment points. The results are given in the form of equations, tables, and plots. A comparison is made with a particular parabola which approximated the troposkien. Author (ERA)

N76-22678# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE: FINAL REPORT TO THE NATIONAL SCIENCE FOUNDATION (WITH APPENDICES) INCLUDES SUMMARY Report for 11 Dec. 1974 - 16 Jun. 1975
16 Jun. 1975 536 p refs
(Grant NSF C-927)
(PB-247243/9; NSF/RA/G-75-027-App) Avail: NTIS HC $13.00 CSCL 05A

This study analyzes 21 RANN projects which, in the judgment of NSF management, were significant in demonstrating fulfillment of the commitment to the practical application of knowledge in the solution of national problems. The 21 studies of specific RANN projects identify examples of utilized research. For example, information that helped the public learn about the energy crisis; a technology for precision bending of large steel beams, which may enhance the competitiveness of American shipbuilders; an enumeration of issues concerning cable television; the productivity of municipal service organizations; and environmental problems. GRA

N76-22679# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE: FINAL REPORT TO THE NATIONAL SCIENCE FOUNDATION (SUMMARY REPORT) Report for 11 Dec. 1974 - 16 Jun. 1975
R. M. Burger 16 Jun. 1975 22 p
(Grant NSF C-927)
(PB-247244/7; NSF/RA/G-75-028) Avail: NTIS HC $3.50 Also included in complete report and summary PB-24243, HC $13.00 CSCL 05A

For abstract, see N76-22678.

N76-22680# Catalytica Associates, Inc., Palo Alto, Calif.
NEW CATALYTIC MATERIALS FOR THE LIQUEFACTION OF COAL Final Report
M. Boudart, J. A. Cusumano, and R. B. Levy Oct. 1975 310 p refs
(PB-247618/2; EPRI-415-FR) Avail: NTIS HC $9.75 CSCL 07D

Potential second-generation catalytic materials for the direct liquefaction of coal to boiler fuel are studied. Both fundamental aspects and engineering constraints were considered in evaluating materials and assigning a priority for further study. A synopsis of relevant background information, the nature of the study, and the evaluation of materials is presented along with a detailed analysis of the physical, chemical and catalytic properties of the materials which were reviewed, and a discussion of the relevance of the physical and chemical properties to catalysis. An evaluation of physical techniques currently used for the study of these properties and the general conclusions of the study are included. GRA

N76-22681# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
HEAT AND MASS TRANSFER IN MODELS OF UNDEVELOPED GEOTHERMAL FIELDS
D. R. Kassoy 16 Jun. 1975 27 p refs Presented at the United Nations Geothermal Symp., San Francisco, May 1975
(Grant NSF AER-74-03429)
(PB-247123/3; CUMER-75-7; NSF/RA/N-75-120) Avail: NTIS HC $4.00 CSCL 08G

A brief summary is given of the nondimensional equations and relevant parameters to be used for describing convection processes in the geothermal setting. Characteristic estimates of flow rates and pressure variation (beyond the hydrostatic value) are given. It is shown that the complete equation system can be reduced in complexity by neglecting terms which describe physically insignificant effects. The resulting equations are used to consider the onset of convection in a horizontal saturated porous slab when a realistic model of viscosity variation is used. It is shown that the classical constant viscosity prediction is in error both quantitatively and qualitatively. A calculation is made for the rate of convective flow in a model fault zone. GRA

N76-22682# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
A SUBSURFACE STUDY OF THE MESA GEOTHERMAL ANOMALY, IMPERIAL VALLEY, CALIF.
H. T. Black 5 May 1975 67 p refs
(Grant NSF AER-74-03429)
(PB-247082/1; CUMER-75-5; NSF/RA/N-75-126) Avail: NTIS HC $4.50 CSCL 08G

A subsurface study of the geological characteristics of the Mesa anomaly is carried out based largely on well logs and histories of five geothermal wells in the area. The coincident resistivity thermal and gravity anomalies are connected with the presence of hot, saline water convecting in a hydrothermally altered fractured system. The system is apparently associated with the intersection of several near-vertical faults. Hot water rising from depth in the fault zone region spreads laterally below the 2500 ft. level merging with the regional northwestern ground water flow pattern. GRA

N76-22683# Federal Energy Administration, Washington, D.C. Office of Analysis, Evaluation and Systems Studies.
THE POTENTIAL FOR ENERGY SAVINGS THROUGH REDUCTIONS IN HOT WATER CONSUMPTION
Apr. 1975 49 p
(PB-247370/0; FEA/D-75/453) Avail: NTIS HC $3.50 CSCL 10A

America's patterns of heated water use are studied. The energy savings obtained from various methods of using hot water are considered along with the economic, social, and institutional problems involved in using hot water. Recommendations for legislation concerning hot water consumption are included. Energy conservation measures are proposed. GRA

N76-22684# Illinois Univ., Champaign. Center for Advanced Computation.
NUCLEAR POWER TO 1985: POSSIBLE VERSUS OPTIMISTIC ESTIMATES, APPENDIX A Final Report
Michael Rieber and Ronald Halcrow May 1975 206 p refs
(Grant NSF GI-35821)
(PB-248061/4; CAC-163-App-A; NSF/RA/N-75-037A) Avail: NTIS HC $7.75 CSCL 10A

The following topics are discussed: the cost of nuclear power; nuclear power forecasts and power availability; fuel cycle costs; uranium costs, uranium reserves, uranium prices; uranium pricing

factors; fuel cycle component costs, background material; capital and related costs. GRA

N76-22685# Illinois Univ., Champaign. Center for Advanced Computation.
THE COAL FUTURE: ECONOMIC AND TECHNOLOGICAL ANALYSIS OF INITIATIVES AND INNOVATIONS TO SECURE FUEL SUPPLY INDEPENDENCE Final Report, Apr. 1974 - May 1975
Michael Rieber, Shao Lee Soo, and James Stuckel May 1975 227 p refs
(Grant NSF GI-35821)
(PB-247678/6; UIUC-CAC-DN-75-163; NSF/RA/N-75-037) Avail: NTIS HC $8.00 CSCL 10A

Nuclear power costs are reevaluated to determine the ceiling price for coal. Low sulfur coal reserves are reestimated on a consumer rather than on an as mined basis. Coal reserve/resource estimating procedures are analyzed for their policy content. Comparative cost estimates are developed for unit trains, slurry pipelines and high pressure pneumatic pipelines. Low Btu coal gasification and stack gas scrubbing are compared for SO2 removal. An analysis of medium Btu coal gasification to increase coal markets is made. GRA

N76-22686# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO. 14: CONSERVING ENERGY
D. N. Morris (RAND Corp., Santa Monica, Calif.) and R. M. Burger 1975 27 p refs
(Contract NSF C-927)
(PB-247258/7; NSF/RA/G-75-042) Avail: NTIS HC $4.00 CSCL 10A

Rand's energy policy study, beginning long before the energy crisis of 1973-74, aimed at understanding the interactions between energy demand and supply, and at developing measures for conserving energy. The research products--reports on industrial energy demand, effects of fuel price increases and projections of electrical energy demand, were designed to give policymakers information on the policy alternatives in managing the nation's energy supplies and their consequences. This report briefly reviews use of the study results. GRA

N76-22687# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO, 18: MANAGEMENT OF HEAT REJECTED FROM POWER PLANTS
G. J. Trezek and V. E. Schrock 1975 21 p refs
(Contract NSF C-927)
(PB-247261/1; NSF/RA/G-75-046) Avail: NTIS HC $3.50 Also included in complete report and summary PB-247243, HC $13.00 CSCL 10A

Various methods for waste heat disposal and minimization of the consequent effects of this disposal on the environment are discussed. Conservation of thermal energy is also of interest. GRA

N76-22688# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO. 20: ENERGY AND ENVIRONMENT
R. S. Carlsmith 1975 26 p refs Prepared in part by Oak Ridge Natl. Lab.
(Contract NSF C-927)
(PB-247263/7; NSF/RA/G-75-048) Avail: NTIS HC $4.00 CSCL 10A

This program supports the following activities: (1) performance of energy research, (2) collection and analysis of energy data from many sources, and (3) dissemination of energy-related information to individuals, companies, and agencies. The program has pursued three broad areas: energy conservation, studies of coal systems, and information on energy research. There are both theoretical and experimental aspects. This report briefly discusses the reception of the research products, disseminated through technical reports, professional meetings, and personal contacts. GRA

N76-22689# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO. 13: CONTINUOUS FABRICATION OF SOLAR CELLS
B. Chalmers and A. I. Mlavsky 1975 25 p Prepared in cooperation with Tyco Labs., Inc., Waltham, Mass. and Harvard Univ., Cambridge, Mass.
(Contract NSF C-927)
(PB-247257/9; NSF/RA/G-75-041) Avail: NTIS HC $3.50 Also included in complete report and summary PB-247243, HC $13.00 CSCL 10B

The objective of this research project is to develop the technology of 'edge-defined, film-fed growth' (EFG), the continuous production of crystal silicon ribbons suitable for manufacturing low-cost silicon solar cells. Various factors have combined to make this research useful to those individuals or industries contemplating methods for mass production of solar cells. GRA

N76-22690# Massachusetts Univ., Amherst. Energy Alternatives Program.
TECHNICAL AND ECONOMIC FEASIBILITY OF THE OCEAN THERMAL DIFFERENCES PROCESS Semiannual Progress Report, 1 Jan. - 30 Jun. 1975
C. R. Adams, W. E. Heronemus, L. L. Ambs, R. H. Kirhhoff, and A. Chajes 1 Sep. 1975 84 p refs
(Grant NSF GI-34979)
(PB-247078/9; NSF/RANN/SE/GI-34979/PR-75-2; NSF/RA/N-75-114) Avail: NTIS HC $5.00 CSCL 10B

The technical and economic feasibility of at least one total system capable of delivering an energy product using the ocean thermal differences solar-energy process is measured. Progress on further description of the total system, major subsystems and components is summarized. GRA

N76-22691# Federal Energy Administration, Washington, D.C. Office of Energy Data Policy.
ENERGY INFORMATION IN THE FEDERAL GOVERNMENT: ENERGY INFORMATION LOCATOR SYSTEM
J. Paul Galliker Nov. 1975 1019 p
(PB-246703/3; FEA/B-75/375) Avail: NTIS HC $28.25 CSCL 10A

Energy and energy-related programs from 44 agencies, bureaus, and commissions in the Federal Government are described. The identification process is developed by the aggregation of energy data descriptors/characteristics (i.e., data on the geographic location of anthracite coal exploration) by the use of energy function matrices that are displayed which, in turn, are linked to subsequent Federal agency summaries and their energy program summaries. A description Directory of 98 existing energy data bases and files is also contained in addition to an overview of the project, techniques and documents employed in the collection of the data. GRA

N76-22692# National Bureau of Standards, Washington, D.C. Materials and Composites Section.
RECOMMENDED CRITERIA FOR RETROFIT MATERIALS AND PRODUCTS ELIGIBLE FOR TAX CREDIT Final Report
Walter J. Rossiter, Jr. and Robert G. Mathey Nov. 1975 45 p refs
(PB-246866/8; NBSIR-75-795) Avail: NTIS HC $4.00 CSCL 10A

The Federal Energy Administration requested the National Bureau of Standards to develop criteria for retrofitting for possible use by the Internal Revenue Service in implementing the Presidential initiative authorizing tax credit to homeowners. Criteria are recommended for materials and products considered eligible for proposed tax credit for retrofitting one and two family residences to conserve energy. The materials considered include insulation and vapor barriers, storm windows and doors, caulking and weatherstripping, and clock thermostats. A list of these retrofit materials is compiled by generic type and recommendations made on their installation. GRA

N76-22693# Helio Associates, Inc., Tucson, Ariz.
AIR-STABLE SELECTIVE SURFACES FOR SOLAR ENERGY COLLECTORS Quarterly Progress Report, 1 May - 31 Jul. 1975

D. B. McKenney and W. T. Beauchamp Jul. 1975 56 p refs (Grant NSF GI-41895)
(PB-247214/0; NSF/RANN/SE-GI-41895/PR-74-6; NSF/RA/N-75-110; QPR-5) Avail: NTIS HC $4.50 CSCL 10B

Production and testing of some of the proposed designs for stable operation in air at high temperatures have been done. The characteristics of these designs and the heat stability test results are presented. Samples have been repeatably produced which have values of solar absorbance greater than 0.95 and values of emittance less than 0.04. Heat tests of these samples show no temperature induced degradation after 1,700 hours exposure to 150 C. A preliminary cost analysis of a planar collector of the Meinel-Trombe design with selective films is included. GRA

N76-22694# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
PROCEEDINGS OF THE WORKSHOP ON SOLAR HEATING AND COOLING OF BUILDINGS
F. Anthony Iachetta, J. Taylor Beard, and Lembit U. Lilleleht 1975 170 p Prepared in cooperation with Am. Soc. of Heating, Refrigerating and Air Conditioning Eng. Inc.
(Grant NSF GI-43965)
(PB-247153/0; NSF/RA/N-74-126) Avail: NTIS HC $6.75 CSCL 13A

The Workshop on the Solar Heating and Cooling of Buildings was convened to make available to the public the findings of the NSF/RANN sponsored Phase 0 feasibility studies on solar heating and cooling of buildings and the results of a number of solar heating experiments. Topic areas covered feasibility; technical and economic considerations; environmental, social, and political aspects; advanced research; and solar heating and cooling experiments. GRA

N76-22695# Westinghouse Electric Corp., Pittsburgh, Pa.
THE ac/dc POWER CONDITIONING AND CONTROL EQUIPMENT FOR ADVANCED CONVERSION AND STORAGE TECHNOLOGY Key Phase Report
Peter Wood Aug. 1975 362 p refs
(PB-247217/3; EPRI-RP390-1-1; Rept-1) Avail: NTIS HC $10.50 CSCL 10B

The best power conversion technologies are established that are applicable to a number of advanced energy storage conversion technologies, including a study of common conversion technology, modular approach to construction costs, research needed prior to practical application, and a preliminary design of the best technology. It was concluded that a common technology can be applied to all sources considered, excepting flywheels, and that a current-fed, naturally commutated inverter is the best short term candidate. GRA

N76-22696# National Governors' Conference, Washington, D.C. Center for Policy Research and Analysis.
STATE ENERGY INFORMATION SYSTEMS: A SURVEY
J. D. DeForest Jul. 1975 64 p
(Grant EDA-99-6-09374)
(PB-247457/5; NATGOV-76/1) Avail: NTIS HC $4.50 CSCL 10A

State level activities in the energy systems area are discussed. The report contains a list of state energy contacts and recommends actions by state governments which could improve the quality of energy information. An overview of energy activities underway in the states is presented. GRA

N76-22697# Oregon State Univ., Corvallis. Water Resources Research Inst.
THE USE OF WASTE HEAT IN A SYSTEM FOR ANIMAL WASTE CONVERSION WITH BY-PRODUCT RECOVERY AND RECYCLING
L. Boersma, E. W. R. Barlow, J. R. Miner, H. K. Phinney, and J. E. Oldfield Oct. 1975 41 p refs
(Contract DI-14-31-0001-4121)
(PB-247555/6; WRRI-38; W76-01806; OWRT-B-039-ORE(3)) Avail: NTIS HC $4.00 CSCL 02C

Society faces many problems related to the consumptive use of nonrenewable natural resources and the environmental degradation resulting from pollution. An animal waste management scheme was developed on the premise that one solution to these problems is the development of integrated production systems with recycled resources. It is proposed to use microorganisms to convert animal waste into a high protein animal feed and a methane-rich fuel gas. A conceptual design for such a system is described and results are presented of preliminary experiments conducted in the laboratory. GRA

N76-22698# Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
EVALUATION OF FISSION PRODUCT AFTER-HEAT Annual Report, 1 May 1974 - 30 Jun. 1975
B. I. Spinrad 30 Jun. 1975 116 p refs
(Contract AT(49-24)-0157)
(PB-247733/9; NUREG-75/099) Avail: NTIS HC $5.50 CSCL 18G

The information available for prediction of fission product heating following nuclear reactor shutdown was evaluated by reviewing the literature on fission product yields, decay schemes, and energies. The result of this review was a critique of the data characterized by a set of recommended data with errors and ranges of error. The after-heat was predicted for a variety of reactor histories by summing the individual contribution of fission product energy deposition at various times after reactor shutdown, with the main emphasis on the time between 0.1 and 1,000 seconds. The target was evaluated as the basic data source. The target was evaluation of after-heat from thermal converter reactors. The chief effort is on nuclides resulting from thermal fission of U235. GRA

N76-22699# National Bureau of Economic Research, Inc., Washington, D.C.
CONFERENCE ON ECONOMETRICS AND MATHEMATICAL ECONOMICS. WORKSHOP ON ENERGY-RELATED GENERAL RESEARCH IN MICRO-ECONOMICS
Robert Solow (MIT), Joseph Stiglitz (Stanford Univ.), and Gary Fromm May 1975 72 p refs Presented at the Conf. on Nat. Resources, Palo Alto, Calif., 9-11 May 1975
(Grant NSF SOC-74-20175)
(PB-247466/6) Avail: NTIS HC $4.50 CSCL 05C

The principles of microeconomics theory were applied to the discovery, extraction, and utilization of natural resources. Sixteen papers are summarized in the workshop report. These papers fall into four general categories: optimal extraction of natural resources; market structure and intertemporal allocation; special problems of exploration and leasing; and the economics of renewable resources. Conference participants also identified an agenda of research in these areas that remained to be done. GRA

N76-22700# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO. 16, TRANSPORTABLE SOLAR LABORATORY
R. LeChevalier 1975 25 p Prepared in cooperation with Honeywell, Inc., Minneapolis, Minn.
(Contract NSF C-927)
(PB-247079/7; NSF/RA/G-75-044) Avail: NTIS HC $3.50 Also included in complete report and summary, PB-247243, HC $13.00 CSCL 13A

The primary objectives of the Transportable Solar Laboratory (TSL) project are to collect data on the performance of a solar energy conversion system, to test that system and its components in actual operation, and to communicate the potential of solar energy conversion systems to community leaders in education, engineering, science, government, and industry. The report briefly discusses use of the TSL. GRA

N76-22701# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO. 17, SOLAR SCHOOL PROJECTS
P. Lawless 1975 26 p refs Prepared in cooperation with AAI Corp., Baltimore, Md., InterTechnology Corp. and General Electric Co., Philadelphia, Pa.
(Contract NSF C-927)
(PB-247260/3; NSF/RA/G-75-045) Avail: NTIS HC $4.00 Also included in complete report and summary, PB-247243,

HC $13.00 CSCL 13A

In response to the energy crisis of 1973-74, NSF-RANN funded proof-of-concept experiments involving the use of solar energy to supply part of the heating required in four public schools. The purpose of the experiments was to demonstrate that solar heating is a technologically viable option in response to the shortage of fossil fuels. The report briefly reviews results of the experiments. GRA

N76-22702# National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.

HEAT TRANSFER IN FURNACES FOR CIB COOPERATIVE PROGRAM AND HEAT BALANCE ANALYSIS OF WALL FURNACE Final Report

J. B. Fang and J. T. Scott Nov. 1975 48 p refs

(PB-247203/3; NBSIR-75-794) Avail: NTIS HC $4.00 CSCL 13A

Tests were conducted in the wall panel furnace as part of a CIB international cooperative program to measure and compare heat transfer in fire endurance furnaces. Additionally, a heat balance analysis showed that a cellular concrete block wall specimen absorbed more heat by convection than by radiation. The rate of radiant heat transfer was found to decrease slowly, while the furnace exhaust heat loss increased during the test from 42 to 58 percent of the heat output. The calculated radiant heat flux incident at furnace walls was found to be somewhat lower than the experimental value measured at the test wall. GRA

N76-22703# Union Carbide Corp., Cleveland, Ohio. Battery Products Div.

EXTRUDED MAGNESIUM TUBING VS IMPACT EXTRUDED CANS IN BA-4386/PRC-25 MAGNESIUM BATTERY Interim Report, Jul. 1971 - Dec. 1973

L. F. Urry Jun. 1975 56 p

(Contract DAAB07-71-C-0235)

(AD-A018204; ECOM-71-0235-1) Avail: NTIS CSCL 10/3

Magnesium cells using cans made by plugging extruded magnesium tubing were compared with those made by the conventional impact extusion from magnesium rod, in A-4386/PRC-25 batteries, to determine if there was an effect on service, storageability and starting delays. Cells and batteries of both types were made simultaneously on standard production equipment, and since the AZ31 magnesium alloys specified was different from the AZ21 now standard for BA-4386/PRC-25 batteries, the rod for the control cans was extruded from the same alloy batch used for the tubing. Thus processability of the tubing was demonstrated and variables were minimized. Whether the can is made from tubing or by impact extrusion, seems to have little effect on performance, and since tubing would be more costly, impact extrusion seems preferable. The composition of the magnesium alloy, and not how it is made into cans, seems to be the more significant variable in the performance of BA-4386/PRC-25 magnesium batteries. GRA

N76-22704# National Energy Information Center, Washington, D.C.

DIRECTORY OF STATE GOVERNMENT ENERGY-RELATED AGENCIES

Neal Moerschel Sep. 1975 235 p

(PB-246891/6; FEA/C-75/515) Avail: NTIS HC $8.00 CSCL 10A

The Directory represents the comprehensive effort of the National Energy Information Center to serve as a national central clearinghouse for energy information. Nine categories of state government energy-related organizations and contacts are identified and include: (1) primary energy agencies; (2) energy conservation; (3) energy facilities siting; (4) comprehensive land use planning; (5) coastal zone management; (6) environmental impact assessments; (7) public utility regulation; (8) legislative committee; and (9) legislative service agencies. GRA

N76-22705# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.

THE ROLE OF CHEMICAL KINETICS IN ENERGY CONSERVATION Final Report

H. M. Rosenstock, D. Garvin, J. T. Herron, and W. Tsang Oct. 1975 123 p refs

(PB-248646/2; NBSIR-75-910) Avail: NTIS HC $5.50 CSCL 07D

Many of the technological areas of pertinence to energy independence involve chemical transformation of gas phase materials at high temperatures. The design, control, and optimization of such devices and processes have come to depend increasingly on mathematical modeling. Among the most important input data required for their models are information on the detailed chemical mechanisms and the rates of the individual processes. It is concluded that although many resources are available there does not exist at present an adequate, publicly available data base for the modeling of high temperature systems. GRA

N76-22706# Environmental Policy Inst., Washington, D.C.

THE NEED FOR ENERGY FACILITY SITES IN THE UNITED STATES: 1985 THROUGH 2000 Final Report

Marc Messing 30 Jun. 1975 68 p refs

(Contract EQ5AD272)

(PB-248153/9; EQ-517514272) Avail: NTIS HC $4.50 CSCL 10A

The Federal Energy Administrations's (FEA's) projections for needed new facilities are analyzed by comparing FEA's data base and forecast methodology used in the Project Independence Report with other estimates of total energy and electrical energy demands. Estimates of the demand for new facilities are compared with current utility plans for new facilities through 1985, and the number of new sites necessary to meet projected facility demands is estimated. A survey of current state laws and provisions for meeting demands on the state level is included. GRA

N76-22707# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PULSE SOURCE OF ENERGY FOR THE FEED OF A PINCH WITH LINER TYPE SET-UP

M. V. Bystrov, V. A. Krylov, B. A. Larionov, V. P. Silin, and A. M. Stolov 28 Nov. 1975 15 p refs Transl. into ENGLISH from Russian Conf. Amerikanskiy Seminar, Doklad. (Leningrad), 23-27 Sep. 1975 p 1-10

(AD-A018532; FTD-ID(RS)I-2381-75) Avail: NTIS CSCL 18/3

In connection with the development of work on a pulse thermonuclear reactor, the creation of pulse sources of feed with a large reserve of energy and duration of its output .0001 and longer is of special current interest. During the development of these sources on the basis of induction collectors of energy, a whole series of problems arise, connected with the design of the collector itself and the realization of fast output of energy using commutating devices with great power, as well as with the design agreement of the collector with the complex of disconnection devices. The induction collectors of toroidal configuration, despite slightly worse overall weight indicators compared with cylindrical collectors, have a number of advantages for short-pulse systems, including: (a) symmetrical arrangement of the sections of the collector, eliminating additional losses in energy in the multiplication circuits of the currents with the parallel connection of the sections; (b) significant weakening of the external fields compared with cylindrical collectors; and (c) the possibility of symmetrical arrangement of the commutating equipment and the ensurance of the mechanical strength of the construction as a whole. GRA

N76-22708# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.

MIXED OXIDES FOR FUEL CELL ELECTRODES Final Report, May 1974 - May 1975

U. Bertocci, M. Cohen, W. S. Horton, T. Negas, and A. R. Siedle Jan. 1976 56 p refs

(PB-248744/5; NBSIR-75-742; EPA-600/2-76-007) Avail: NTIS HC $4.50 CSCL 10B

Mixed oxides were studied in order to determine if such materials could act as oxygen-reducing electrocatalysts in an acid fuel cell. Choices were based upon producing variable valence and upon conferring stability at elevated temperatures in phosphoric acid. Barium ruthenate and the systems Ti-Ta-O, V-Nb-O, V-Ta-O, Ce-Ta-O were hot-acid stable. Potentiodynamic and galvanostatic studies are reported on materials from the

Ti-Ta-O system, TiO2 as grown, TiO2 reduced with hydrogen, TiO2 with 0.1% Nb, lanthanum titanates with and without calcium or strontium, a tungsten bronze, barium ruthenate, and strontium titanate with .03% and with .15% Nb. GRA

N76-22709# Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
DEVELOPMENT OF STRATEGIES TO REDUCE THE VULNERABILITY OF UNITED STATES AGRICULTURE TO DISRUPTIONS FROM ENERGY SHORTAGES AND PRICE INCREASES, FIRST YEAR REPORT Annual Report, Jun. 1974 - Jul. 1975
1 Aug. 1975 13 p refs
(Grant NSF GI-043890)
(PB-248288/3; NSF/RA/N-75-169) Avail: NTIS HC $3.50 CSCL 02B

The adverse effects that energy shortages and price increases could have on U.S. agriculture are identified, and alternative production strategies to minimize these effects are evaluated. This study develops an energy vulnerability index to estimate how seriously both energy shortages and price increases could disrupt the production of major agricultural commodities. It also analyzes production methods, comparing the energy use of conventional production methods (high in application of nitrogen fertilizers and synthetic pesticides) with that of organic production methods. GRA

N76-22710# Nuclear Regulatory Commission, Washington, D.C. Office of Nuclear Material Safety and Safeguards.
STATEMENT BEFORE THE ENERGY AND DIMINISHING MATERIALS COMMITTEE OF THE CALIFORNIA LEGISLATIVE ASSEMBLY
R. G. Page 18 Nov. 1975 117 p refs
(PB-247890/7; NUREG-75/114) Avail: NTIS HC $5.50 CSCL 18J

An overview is given of the Nuclear Regulatory Commission's safeguards requirements for the protection of nuclear power plants, nuclear fuel reprocessing and fabrication facilities, and special nuclear material in transit. Safeguards measures to meet these requirements are employed to prevent the theft or diversion of significant amounts of nuclear materials and prevent the sabotage of nuclear facilities which would be inimical to the national security or to the public health and safety. Sabotage vulnerability of nuclear reactors, the consequences of theft of nuclear materials, and the increased plutonium handling requirements associated with the widescale use of plutonium in light water reactors and the use of breeder reactors are discussed. GRA

N76-22711# Mitre Corp., McLean, Va.
EPA PROGRAM STATUS REPORT, SYNTHETIC FUELS PROGRAM Final Report
Bruce Truett, Robert G. Murray (Stanford Res. Inst., Menlo Park., Calif.), and Gary Foley (EPA, Washington, D. C.) Oct. 1975 32 p refs
(Contract EPA-68-01-2940)
(PB-247140/7; EPA-600/2-75-070) Avail: NTIS HC $4.00 CSCL 21D

The status of EPA's Synthetic Fuels Program as of September, 1974 is presented in nontechnical language. This program is a part of EPA's work directed toward providing the necessary technology for meeting near-term and long-term energy requirements in an environmentally acceptable manner. The program is aimed at controlling and preventing environmental pollution when coal and other fossil hydrocarbons are converted to synthetic fuels and are used as products. Program objectives and responsibility are presented in relation to funding level. Significant accomplishments of the program are summarized, and the thrust of future research is discussed. GRA

N76-22712# Institute of Gas Technology, Chicago, Ill.
UTILIZATION OF OFF-PEAK POWER TO PRODUCED INDUSTRIAL HYDROGEN Final Report
Nicholas Bierderman, Kenneth Darrow, Jr., and Alex Konopka Aug. 1975 195 p refs
(IGT Proj. 8793)
(PB-247219/9; EPRI-230-1-FR) Avail: NTIS HC $7.50 CSCL 21D

An analytical methodology for determining the economic and technical feasibility of using off-peak power to generate hydrogen that can be sold to industry as a fuel or commodity was developed. Such a scheme might represent an attractive use of off-peak power and could provide the first step toward building a hydrogen-energy system. Specialty markets that seem most susceptible to the use of off-peak-produced hydrogen, the economics of electrolytic hydrogen production, a techno-economic discussion of hydrogen storage and transportation, and the methodology by which a utility can initially evaluate the possibilities of supplying a particular hydrogen user in its service area with hydrogen produced form off-peak electric power are discussed. GRA

N76-22713*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE-BASED SOLAR POWER CONVERSION AND DELIVERY SYSTEMS (STUDY), ENGINEERING ANALYSIS
C. A. Nathan 6 Aug. 1975 78 p
(Contract NAS8-31308)
(NASA-CR-144252; A31640; GAC-NSS-P-75-001) Avail: NTIS HC $5.00 CSCL 10A

A systems analysis of synchronous, orbit-based power generation and relay systems that could be operational in the 1990's is described along with a comparison with earth-based systems to be operational in the same time frame. Operational and economic requirements for the orbiting systems and near term research activities which will be required to assure feasibility, development, launch and operational capabilies of such systems in the post- 1990 time frame are examined. Author

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N76-22714 Pittsburgh Univ., Pa.
A POLAROGRAPHIC METHOD FOR THE DETERMINATION OF ATMOSPHERIC SULFUR DIOXIDE AND A STUDY OF THE ELECTROCHEMICAL SYSTEM Ph.D. Thesis
Robert William Garber 1975 170 p
Avail: Univ. Microfilms Order No. 76-8803

An analysis is presented which is based upon the solubility of sulfur dioxide in dimethyl sulfoxide and the voltammetric measurement of the sulfur dioxide in the solution. The analytical procedure has three steps: (1) the sulfur dioxide is absorbed from the air using a solution of dimethyl sulfoxide a supporting electrolyte such as lithium chloride, (2) dissolved oxygen is removed by bubbling oxygen free nitrogen through the solution, and (3) a cathodic differential pulse polarogram is run on the solution over the potential region from -0.6 to -0.9 volts versus the silver - silver chloride reference electrode. A peak occurring between -0.7 and -0.8 volts is indicative of sulfur dioxide while the peak height is proportional to the concentration of sulfur dioxide in solution. With this technique the determination of sulfur dioxide concentrations in air of 0.03 ppm were carried out. Increases in the air to solvent contact volume ratio combined with a larger area stationary electrodes indicated that greater sensitivity is possible. Dissert. Abstr.

N76-22715 Oklahoma State Univ., Stillwater.
HEAVY METALS IN WATER SEDIMENTS, AND CHIRONOMIDS IN A STREAM RECEIVING DOMESTIC AND OIL REFINERY EFFLUENTS Ph.D. Thesis
Harold Eugene Namminga 1975 132 p
Avail: Univ. Microfilms Order No. 76-9733

Distribution of copper, chromium, lead, and zinc in water, sediments, and chironomids was studied in a stream receiving oil refinery and municipal sewage effluents. The objectives of this study were to (1) measure the concentrations of four heavy metals in water, sediments, and chironomids in Skeleton Creek; (2) estimate accumulation of heavy metals in sediments and chironomids above levels in water; (3) determine if cool and warm season conditions change the distribution of heavy metals in water, sediments, and chironomids; (4) determine the effect of high discharge on concentrations of metals in water and sediments; and (5) determine if oil refinery equipment cleaning

increases the concentrations of metals in water and sediments. Dissert. Abstr.

N76-22716 California Univ., Los Angeles.
ENVIRONMENTAL ISSUES IN THE SITING, CONSTRUCTION AND OPERATION OF NEW COAL-FIRED AND NUCLEAR POWER PLANTS Ph.D. Thesis
Anthony Francis Moscati, Jr. 1975 197 p
Avail: Univ. Microfilms Order No. 76-9004

A discussion is presented of some of the major interfaces between efforts toward environmental preservation and the expansion of the nation's power supply. Ways in which environmental goals may be attained within the framework of a comprehensive energy policy are also discussed. Emphasis is placed on the environmental issues encountered in the siting, construction, and operation of new coal-fired and nuclear power stations; no attempt is made to evaluate environmental aspects of such related activities as fuel mining, processing, and recycling. Recommendations made concerning the integration of environmental concerns into the regulatory framework include suggestions for streamlining the environmental review process.Dissert. Abstr.

N76-22717 Purdue Univ., Lafayette, Ind.
OPTIMAL AND SUBOPTIMAL CONTROL OF AUTOMOTIVE ENGINE EFFICIENCY AND EMISSIONS Ph.D. Thesis
Ramachandra Prabhakar 1975 341 p
Avail: Univ. Microfilms Order No. 76-7119

The engineering problem treated is the development of a control scheme to reduce emissions without undue loss in fuel economy. As an adjunct to this work the problem of reducing fuel consumption without regard for emission control is also treated. The control variables used are air-fuel ratio, exhaust gas recirculation, and spark advance. Vehicles equipped with conventional internal combustion engines are studied. No exhaust treatment devices, as for example the catalytic converter, are used for emission reduction. Exhaust emission rates are modeled using empirical correlation techniques. The techniques were applied to two different vehicles, a 1970 Ford Thunderbird and a 1971 Chevrolet. The results indicate that the functional forms are applicable for different designs of internal combustion engines. Dissert. Abstr.

N76-22718+ Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.
PCB IN WATER: A BIBLIOGRAPHY, VOLUME 2
Dec. 1975 295 p refs
(PB-248141/4; OWRT/WRSIC-75-208-Vol-2; W76-02371) Avail: NTIS HC $9.25 CSCL 13B

This report, containing 177 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base searched had 38,106 abstracts covering SWRA from January, 1973 (Volume 6, Number 1) through October, 1975 (Volume 8, Number 20). Author and subject indexes are included. GRA

N76-22719*# College of William and Mary, Williamsburg, Va. Physics Dept.
ATLAS OF INFRARED ABSORPTION LINE
Jae H. Park [1976] 31 p refs
(Grant NsG-1203)
(NASA-CR-144976) Avail: NTIS HC $4.00 CSCL 13B

An atlas of infrared absorption line positions vs. line strengths at 300 K is presented for 13 gases from 500 per cm to 7,000 per cm. The absorption bands for each gas shown in the atlas including sources of data are summarized. This atlas is used for feasibility studies of remote sensing of atmospheric pollutants; for the identification of gases in atmospheric absorption spectra; and for obtaining information on (1) what gases contribute to the energy absorption in the spectral regions and (2) their relative strengths in absorption. Special attention should be given to the scale of line strength. The lines are grouped into intervals of 250 per cm, and only those lines with a strength within 0.0001 of the maximum value are shown in each interval. Author

N76-22720*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL MEASUREMENTS OF THE GROUND CLOUD GROWTH DURING THE 11 FEBRUARY 1974, TITAN-CENTAUR LAUNCH AT KENNEDY SPACE CENTER
Roger B. Stewart, Ronald J. Sentell, and Gerald L. Gregory Feb. 1976 50 p refs
(NASA-TM-X-72820) Avail: NTIS HC $4.00 CSCL 13B

The Titan-Centaur was launched from Kennedy Space Center on February 11, 1974 at 0948 eastern daylight time. Ground level effluent measurements were obtained from the solid rocket motors for comparison with NASA diffusion models for predicting effluent ground level concentrations and cloud behavior. The results obtained provide a basis for an evaluation of such key model inputs such as cloud rise rate, stabilization altitude, crosswind growth, volume expansion, and cloud trajectory. Ground level effluent measurements were limited because of changing meteorological conditions, incorrect instrument location, and operational problems. Based on the measurement results, operational changes are defined. Photographs of the ground exhaust clouds are shown. The chemical composition of the exhaust gases was analyzed and is given. Author

N76-22721# Council on Environmental Quality, Washington, D.C.
ENVIRONMENTAL QUALITY, 1975 Annual Report
Dec. 1975 798 p refs
(AR-6) Avail: NTIS MF $2.25; SOD HC $6.60

Progress in improving the environmental quality is reported. Areas surveyed include: carcinogens in the environment, perspectives on the environment, environmental conditions and trends, a global environment, and the national environmental policy act. F.O.S.

N76-22722# ARO, Inc., Arnold Air Force Station, Tenn.
A STUDY OF THE JETTISONING OF JP-4 FUEL IN THE ATMOSPHERE Final Report, 1 Jul. 1972 - 31 Aug. 1974
R. Dawbarn, K. W. Nutt, and C. W. Pender AEDC Nov. 1975 84 p refs
(AD-A017555; ARO-VKF-TR-74-107; AEDC-TR-75-49) Avail: NTIS CSCL 21/4

This study was undertaken at AEDC to provide information relating to the impact on the environment when JP-4 fuel is jettisoned from jet planes. The specific areas investigated were (1) the physical breakup of the JP-4 into droplets, (2) the physical properties of JP-4, (3) the drag coefficient of JP-4 droplets, (4) the evaporation characteristics of JP-4 droplets, and (5) the effects of JP-4 on the atmospheric processes of condensation of water vapor. Data and information provided in the first four areas should be useful in developing a computer model to predict the eventual distribution of JP-4 from a specific fuel dump under particular atmospheric conditions. The results of the studies in the area of atmospheric condensation indicate JP-4 vapors should have neglibible effects. However, small JP-4 droplets may act as effective seed nuclei to initiate precipitation under favorable conditions. GRA

N76-22723# Sandia Labs., Albuquerque, N.Mex.
HIGH LEVEL WASTE MELTING EXPERIMENT
R. D. Klett 1975 16 p refs Presented at the Conf. on Waste Management 75, Tucson, 24 Mar. 1975 Sponsored by ERDA
(SAND-75-5294; Conf-750321-1) Avail: NTIS HC $4.00

An overview is given of the Deep Rock High Level Nuclear Waste Disposal Process (DRC) and the first medium scale demonstration test. The DRD process consists of placing solidified high level waste, either uncontained or in expendable containers, in holes several kilometers deep which are drilled into bedrock. With the holes 0.3 to 3 m in dia, the radioactive decay heat would melt and mix the waste and surrounding rock. After resolidification in 5 to 20 years, the waste/rock matrix would form a dilute, low surface area, low leachability solid plugpermanently emplaced several kilometers below the earth's surface. Progress to date in identifying and developing DRD technology has centered around the DRD-1 test. In this experiment, a waste simulant was electrically heated to 1320 C in a 1 m by 0.15 m dia cavity in a block of dolerite rock. The presence of convec-

tion and mixing was confirmed and the thermal model of the test was verified. Author

N76-22724# Miami Univ., Fla.
ECOLOGICAL STUDY OF THE EFFECTS OF NUCLEAR POWER PLANTS ON BENTHIC MACROPLANT MICROCOSMS IN SUBTROPICAL AND TROPICAL ESTUARIES
Annual Progress Report, 1974 - 1975
A. Thorhaug May 1975 10 p
(Contract AT(40-1)-4493)
(ORO-4493-2) Avail: NTIS HC $4.00

Progress is reported on the following research projects: the dynamic ecology of Thalassia and studies of the Thalassia community; basic ecology of Thalassia growth and reproduction; red macroalgal ecology; green macroalgal ecology; transplantation of Thalassia; succession in a previously damaged Thalassia community at Turkey Point; and thermal ecology of the Thalassia community of Card Sound and Turkey Point. NSA

N76-22725# Energy Research and Development Administration, Las Vegas, Nev. Nevada Operations Office.
LONG-TERM RADIOLOGICAL SURVEILLANCE PROGRAM
Mar. 1975 23 p
(NVO-143) Avail: NTIS HC $4.50

The U. S. Energy Research and Development Administration (ERDA) is committed to ensure that no public safety hazard exists or has developed at any site used for nuclear experimentation. The Tatum Dome Test Site, used for Project Dribble, was the site of two nuclear and two nonnuclear events between 1964 and 1970. No radioactive contaminants were released to the environment by the actual tests themselves; however, minor releases did occur in connection with reentry drilling. The site was decontaminated, restored to near preshot conditions, and deactivated in 1972. No need for bioenvironmental monitoring, soil sampling, or seismic monitoring has been demonstrated for this site. However, water from all water-bearing formations above the Cook Mountain limestone and from the surface in the vicinity of the site will be periodically sampled, including deep wells, domestic wells, surface waters, and municipal water supplies. The sampling program will continue until it can be established that the need no longer exists. ,Author (NSA)

N76-22726# Scripps Institution of Oceanography, La Jolla, Calif.
DEPOSITION OF THE TRACE HEAVY METALS POLONIUM AND PLUTONIUM ONTO MARINE SURFACES
V. F. Hodge, T. R. Folsom, J. P. Cowen, and G. J. Parks, Jr. 13 Dec. 1974 11 p refs Presented at the ann. meeting on Deposition of the Trace Heavy Metals Polonium and Plutonium onto Marine Surfaces, San Francisco Sponsored by ERDA and the Navy
(CONF-741251-1) Avail: NTIS HC $4.00

Plutonium and polonium assays of the giant kelp revealed that most of the Pu and Po was in the surface scrapings. Both nuclides were concentrated to 1,000 times their sea water concentrations; there was usually 200 times more Po activity than Pu. Field experiments using Macrocystis pyrifera showed that Pu and Po accumulated in proportion with time and surface area and that approximately four times more Pu and Po were found on oldest tissues. When glass microscope slides were exposed alongside living plants, deposition rates for Po were identical and Po deposited about 200 times faster than Pu. NSA

N76-22727# Scripps Institution of Oceanography, La Jolla, Calif. Soledad Lab.
RATIONAL REFERENCE LEVELS FOR PACIFIC COAST RADIOACTIVE POLLUTION STUDIES SUPPLIED BY SAMPLES FROM NORTHERN BAJA CALIFORNIA
T. R. Folsom 1974 16 p refs Presented at the Mexican Geophys. Union Ann. Meeting, Ensenada, Calif. Sponsored by ERDA and the Navy
(CONF-7306121-1) Avail: NTIS HC $4.00

Background levels of radioactivity in the marine environment along the Pacific coast are at present extremely low. However, these certainly will rise along with the growth of coastal populations and with the increased use of nuclear energy. It would be desirable to anticipate where and how fast concentrations of artificial radioactivities may reach unacceptable levels in coastal water. Successful prediction of this sort requires knowing how the ocean responds, in given regions, to specific inputs. Fortunately, some of the fate of a large class of radioactive pollutants that must be faced in the future may be inferred from careful studies during the past 20 years of the behavior of certain constituents of nuclear fallout that have entered the ocean along the coasts of California and Baja California. NSA

N76-22728# Royal Netherlands Meteorological Inst., De Bilt.
VALIDATION OF A MULTIPLE SOURCE DIFFUSION MODEL BASED ON THE GAUSSIAN PLUME MODEL
F. T. M. Nieuwstadt and H. vanDop 1975 29 p refs Presented at the 6th NATO/CCMS Intern. Tech. Meeting on Air Pollution Modeling, Frankfurt am Main, 24-26 Sep. 1975
(APM-6/3) Avail: NTIS HC $4.00

With a dispersion model, the average concentration pattern can be calculated from a given emission. The averaging time considered is in the order of at least a few months. The area may contain (low and high) point sources and area sources, so that a large source complex can be handled. The model was tested for a part of the Netherlands. January, February, March, October, November, and December 1972 were chosen as testing period. The pollution component for which the validation was carried out was sulfur dioxide, as this was the most extensively and rather accurately measured component at that time. The spatial correlation coefficients between the measured and calculated concentrations averaged over the period of six months were about 0.75. The mean relative difference between the two concentrations amounted to only about 5% with a standard deviation of 20%. Author (ESA)

N76-22729# Delft Hydraulics Lab. (Netherlands).
A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER
J. H. G. Verhagen, J. C. H. Peeters (Min. of Public Works and Transport), and R. Peelen (Delta Inst. for Hydrobiol. Res.) Nov. 1975 11 p refs Presented at the 16th Intern. Assoc. for Hydraulic Res. Congr., Sao Paulo, Brazil, Jul. 1975
(Publ-151) Avail: NTIS HC $3.50

The phytoplankton-zooplankton-nutrient dynamic model was applied to the analysis of biological and chemical systems interactions of Brielse Meer in the Netherlands considering the following three state variables: the biomass of phytoplankton, the biomass of zooplankton, and the concentration of the ortho-phosphate phosphorus as growth-limiting nutrient. From an evaluation of the results it appears that the vertical migration of phytoplankton, especially the blue green species, is an important mechanism in the planktodynamics of a shallow turbid lake, and preference of zooplankton to distinct phytoplankton species should be included in a biological model of a hypertrophic lake.
Author (ESA)

N76-22730# European Space Agency, Paris (France).
DETECTION AND MEASUREMENT OF NO, NO2 AND HNO3 WITHIN THE STRATOSPHERE
Jean-Claude Fontanella Dec. 1975 103 p refs Transl. into ENGLISH of 'Detection et Dosage de NO, NO2 et HNO3 dans la Stratosphere', ONERA, Paris Report ONERA-NT-235, 1974 (ESA-TT-233; ONERA-NT-235) Avail: NTIS HC $5.50

In 1973, measurements were performed of the concentrations of the oxides of nitrogen NO and NO2 and of nitric acid using balloons and the Concorde aircraft as platforms. The method used was absorption spectrometry in the infrared range (5 to 8 micron), using the sun as a source. The instrumentation consisted of Girard-type grating spectrometer, associated with a solar pointer. The high resolution (0.1/cm) made it possible for the first time to reveal and measure the content of nitric oxide NO. Spectra of nitrogen dioxide and of nitric acid were also recorded. Quantitative interpretation of the spectra obtained is mainly dealt with. Problems related to detection and estimation, by this method, of the minor constituents of the atmosphere are also examined.
Author (ESA)

N76-22731# Environmental Research and Technology, Inc., Concord, Mass.
ADAPTATION OF GAUSSIAN PLUME MODEL TO INCORPORATE MULTIPLE STATION DATA INPUT, VOLUME 1
Final Report
Harvey S. Rosenblum, Bruce A. Egan, Claire S. Ingersoll, and

Michael J. Keefe Jun. 1975 71 p refs
(Contract EPA-68-02-1753)
(PB-247564/8; ERT-P-1121-Vol-1; EPA-600/3-75-003-a)
Avail: NTIS HC $4.50 CSCL 04B

Urban dispersion models were modified to consider multiple station information on wind speed and direction. The modifications had two basic objectives: to develop techniques for describing wind conditions at any point within a region in which arbitrarily-located observing points exist; and second, to identify critical points in the dispersion algorithms at which the additional multiple-station wind data could be incorporated. The results of applications to hypothetical meteorological situations indicate that more realistic results can be obtained by the incorporation of multiple-station data. GRA

N76-22732# Environmental Research and Technology, Inc., Concord, Mass.
ADAPTATION OF GAUSSIAN PLUME MODEL TO INCORPORATE MULTIPLE STATION DATA INPUT. VOLUME 2: APPENDICES Final Report
Harvey S. Rosenblum, Bruce A. Egan, Claire S. Ingersoll, and Michael J. Keefe Jun. 1975 137 p
(Contract EPA-68-02-1753)
(PB-247565/5; ERT-P-1121-Vol-2) Avail: NTIS HC $6.00 CSCL 04B

Contents: Appendix A, User's guide to RAM modifications; Appendix B, User's guide to SCIM modifications; Appendix C, User's guide to CDM modifications. GRA

N76-22733# Exxon Research and Engineering Co., Linden, N.J.
EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION: SECTION 6 (HYGAS PROCESS) Final Report
C. E. Jahnig Aug. 1975 60 p refs
(Contract EPA-68-02-0629)
(PB-247225/6; EXXON/GRU.11DJ.75; EPA-650/2-74-009-h)
Avail: NTIS HC $4.50 CSCL 07A

The quantities of solid, liquid, and gaseous effluents were estimated, where possible, as well as the thermal efficiency of the process. For the purpose of reduced environmental impact, a number of possible process modifications or alternatives which could facilitate pollution control or increase thermal efficiency were proposed, and new technology needs were pointed out. GRA

N76-22734# Exxon Research and Engineering Co., Linden, N.J.
EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION: SECTION 7 (U-GAS PROCESS) Final Report
C. E. Jahnig Sep. 1975 46 p refs
(Contract EPA-68-02-0629)
(PB-247226/4; EXXON/GRU.12DJ.75; EPA-650/2-74-009-i)
Avail: NTIS HC $4.00 CSCL 07A

Results are given for the U-Gas Process from the standpoint of its effect on the environment. The quantities of solid, liquid, and gaseous effluents were estimated, where possible, as well as the thermal efficiency of the process. For the purpose of reducing environmental impact, a number of possible alternatives are discussed, and technology needs are pointed out. GRA

N76-22735# Stanford Univ., Calif. Program in Engineering-Economic Planning.
NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PHASE 1, EFFECT OF THE REVIEW AND COMMENT PROCESS ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE
William W. Hill and Leonard Ortolano Sep. 1975 218 p
(Contract DI-14-31-0001-9017)
(PB-247433/6; SU-EEP-52; W76-01800;
OWRT-C-4080(9017)(1)) Avail: NTIS HC $7.75 HC also available in set of 2 reports as PB-247432-SET, HC $15.00 CSCL 13B

The review and comment process refers to the circulation of environmental impact statements, and earlier informal versions thereof, to agencies and publics for review and comment pursuant to the requirements of section 102(2) (C) of the National Environmental Policy Act of 1969 (NEPA). The Effect that this process has had on Corps of Engineers' pre-authorization studies and Soil Conservation Service small watershed planning is examined. GRA

N76-22736# Stanford Univ., Calif. Program in Engineering-Economic Planning.
NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PHASE 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA
John Randolph and Leonard Ortolano Sep. 1975 236 p refs
(Contract DI-14-31-0001-9017)
(PB-247434/4; SU-EEP-53) Avail: NTIS HC $8.00 HC also available in set of 2 reports as PB-247432-SET, HC $15.00 CSCL 13B

The procedures followed by federal agencies in the implementation of section 102(2) (C) of the National Environmental Policy Act of 1969 (NEPA) were examined. The effectiveness of the 102 process in integrating environmental factors in planning was analyzed. The approach relied on written documentation and personal interviews to provide an historical analysis of factors relevant to decision making in the context of the case studies. GRA

N76-22737# Delaware Univ., Newark. Dept. of Chemical Engineering.
SOLUBILIZATION AND WET OXIDATION OF SUSPENDED AND DISSOLVED ORGANICS
James R. Katzer Sep. 1975 112 p refs
(Contracts DI-14-31-0001-4008;
DI-14-31-0001-5008)
(PB-247106/8; W76-01506; OWRT-A-027-DEL(1)) Avail: NTIS HC $5.50 CSCL 07A

The aqueous phase solubilization of yeast and the aqueous phase oxidation of glucose were studied in an autoclave between 150 and 230C and 0 to 470 psia O2 pressure. The rate of yeast solubilization was first order in solids concentration and involved both rapid oxidation and slower hydrolysis reactions. The aqueous phase oxidation of glucose was first order in glucose consumption and in total organic carbon (TOC) removal. Glucose consumption occurs by a thermal (hydrolytic or dehydrative) decomposition and an oxidative mechanism. The activation energy for both glucose oxidation and TOC removal and for yeast solubilization was about 17 kcal per mole. GRA

N76-22738# Southern Research Inst., Birmingham, Ala.
PARTICULATE COLLECTION EFFICIENCY MEASUREMENTS ON THREE ELECTROSTATIC PRECIPITATORS Final Report, Jul. 1973 - Jul. 1975
Grady B. Nichols and Joseph D. McCain Oct. 1975 85 p refs Prepared for Kellogg (M.W.) Co., Houston, Tex.
(Contract EPA-68-02-1308)
(PB-248220/6; SORI-EAS-75-428; Rept-3296-2;
EPA-600/2-75-056) Avail: NTIS HC $5.00 CSCL 07A

Results are given of a determination of the operating characteristics of three full-scale electrostatic precipitators (ESP's), made to provide definitive data on their performance. The measured performance of these ESP's was compared with the theoretically predicted efficiencies computed by an ESP mathematical model. Field measurements to total inlet and outlet mass concentrations, particle size distributions, and electrical data were used for these comparisons. Descriptions of the measurement procedures and the mathematical model are included. GRA

N76-22739# Utah Water Research Lab., Logan.
OPTIMIZATION OF WATER ALLOCATION, WASTE WATER TREATMENT, AND REUSE CONSIDERING NONLINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES
A. Bruce Bishop, Rangesan Narayanan, Suravuty Pratishthananda, Stanley L. Kelmetson, and William J. Grenney Jun. 1975 131 p
(Contract DI-14-31-0001-4133)
(PB-248070/5; PRWG-123-2; W76-02636;
OWRT-B-097-UTAH(1)) Avail: NTIS HC $6.00 CSCL 13B

Using systems engineering and operations research techniques, the report focuses on the optimal management and use of water of impaired quality in a water resources system, including utilizating of irrigation return flows and other poor quality water, water quantity and quality management systems, and wastewater

reclamation opportunities. The study develops a mathematical programming transportation or transshipment model formulated for the lower Jordan River Basin in Utah. The model incorporates all 'possible' water resources (including sequential and recycled reuse of water) to supply spatially separated multi-sector water users considering non-linear costs with economies of scale for water supply and wastewater treatment, temporal aspects of seasonality and stochastic nature of water supply and demand, and the system effects of higher wastewater treatment levels. The results of the model runs give specific allocations of water from the available sources to meet use sector requirements over a planning horizon from 1975 to 2020. GRA

N76-22740# Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.

EVALUATING A MATHEMATICAL MODEL FOR PREDICTING LAKE EUTROPHICATION

G. M. Hornberger, M. G. Kelley, and T. C. Lederman Sep. 1975 102 p refs Prepared in cooperation with Virginia Univ.
(PB-248049/9; VPI-WRRC-Bull-82; W76-02370;
OWRT-A-045-VA(2)) Avail: NTIS HC $5.50 CSCL 13B

A mathematical model of a lake ecosystem is developed and then tested to indicate what ecological changes, in particular eutrophication, would result from changes in the physical environment. The model was developed using a digital computer. In situ enrichment experiments then were performed to assess the relationship between nutrient concentrations and the growth of phytoplankton. The investigation included an evaluation of the use of nonlinear parameter estimation in determining the model's growth constants. The model did demonstrate that it could provide useful qualitative information. Field experiments did not, however, produce data suitable for quantifying the relationship between species diversity and nutrient addition showed that a diversity index holds little promise for use as a quantitative indicator of eutrophic conditions. GRA

N76-22741# Oregon State Univ., Corvallis. Dept. of Civil Engineering.

TIDAL FLATS IN ESTUARINE WATER QUALITY ANALYSIS Final Ecological Research Series

David A. Bella Jun. 1975 200 p refs Sponsored by EPA
(PB-248196/8; EPA-660/3-75-025) Avail: NTIS HC $7.50 CSCL 13B

A conceptual model of estuarine benthic systems was developed and a classification system of estuarine benthic deposits which is based on the availability of hydrogen acceptors and reactive iron was developed. Field studies demonstrated that estuarine sediments and overlying wastes could contain significant concentrations of free sulfides which are toxic to a variety of organisms. Results from experiments using extracts from benthic deposits and algal mats demonstrated a close relationship between the rate of sulfate reduction and the sulfate and soluble organic carbon concentrations. A variety of activities which could contribute to significant environmental changes with estuarine benthic systems were identified. GRA

N76-22742# Hydrocomp, Inc., Palo Alto, Calif.

EVALUATION OF THE EFFECTS OF URBANIZATION ON AQUATIC ECOLOGY AND HYDROLOGIC REGIMES

Jul. 1975 167 p refs
(Contract DI-14-31-0001-4203)
(PB-247095/3; W76-01514; OWRT-C-5103(4203)(1)) Avail: NTIS HC $6.75 CSCL 08H

Three hypothetical watersheds were simulated with and without urbanization. Each watershed was assumed to have the hydrometeorologic, topographic, soils, and vegetation characteristics of a real watershed. Frequency of peak flows, total annual runoff, flow duration data for 1-day and 21-day intervals, annual mass discharge of biochemical oxygen demand (BOD), and frequency of occurrence of various levels of B.O.D. and dissolved oxygen concentrations were simulated for each watershed with and without urbanization to illustrate the impact of urbanization on the stream hydrology and water quality. GRA

N76-22743# Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.

ECONOMICS OF WATER SUPPLY PLANNING AND MANAGEMENT

J. C. Frey, H. B. Gamble, and O. H. Sauerlender Jun. 1975 159 p
(Contract DI-14-31-0001-3688)
(PR-247560/6; W76-01802; Research-Pub-90;
OWRT-C-3119(3688)(1)) Avail: NTIS HC $6.75 CSCL 13B

A sampling of medium sized cities in the Northeastern United States provided data and information useful in understanding the organization and management of municipal water utilities. The following objectives were pursued: (1) identification and description of political, demographic, systemic and economic characteristics of water utility systems; (2) development of an index for evaluating the capacity of water supply systems to accommodate potential demands; (3) development of a cost function to determine whether economies of scale can be exploited in developing systems and (4) estimation of the elasticity of residential demand for water to determine the feasibility of alleviating the consequences of drought by flexible pricing. GRA

N76-22744# Center for the Environment and Man, Inc., Hartford, Conn.

SERVICES IN CONNECTION WITH REVIEW AND REFINEMENT OF CIAP MONOGRAPH 3 Final Report

G. D. Robinson Aug. 1975 105 p refs
(Contract DOT-OS-50022)
(PB-247659/6; CEM-4179-530; DOT-TST-76-28) Avail: NTIS HC $5.50 CSCL 04A

Work was performed in connection with the writing of Climatic Impact Assessment Program (CIAP) monograph 3: The Stratosphere Perturbed by Propulsion Effluents. The major written contribution appearing in this report is a draft of chapter 1: A Summary of Methods and Findings, of monograph 3. Other original written contributions were: One-dimensional stratospheric transport models applied to some C-14 data. This, appendix B, is a comment on some of the material of chapter 5, monograph. GRA

N76-22745# New England Plating Co., Worcester, Mass.

ELECTROLYTIC TREATMENT OF JOB SHOP METAL FINISHING WASTEWATER Final Report

Bruce F. Warner Sep. 1975 164 p refs Sponsored by EPA
(PB-246560/7; EPA-600/2-75-028) Avail: NTIS HC $6.75 CSCL 13B

Full scale in-plant production studies demonstrated the reliability and economics of electrolytic cells containing beds of conductive particles between cathodes and anodes for reduction of hexavelent chromium and oxidation of cyanide in plating rinse water. The heavy metals are subsequently removed from the waste water by alkali precipitation. Seventy-five liter/min. (20 GPM) sized cells were employed for chromium and cyanide rinses. Chromium concentrations to 250 mg/liter and cyanide concentrations to 150 mg/liter were processed. Data were obtained with parallel equipment using chemical treatment for cost comparison. Waste treatment costs, capital and operating, for the job shop are provided with an assessment of total costs on the price of services provided. GRA

N76-22746# Acurex Corp., Mountain View, Calif. Aerotherm Div.

NO SUB x COMBUSTION CONTROL METHODS AND COSTS FOR STATIONARY SOURCES. SUMMARY STUDY Final Report, Aug. 1974 - Apr. 1975

A. B. Shimizu, R. J. Schreiber, H. B. Mason, G. G. Poe, and S. B. Youngblood Sep. 1975 117 p refs
(Contract EPA-68-02-1318)
(PB-246750/4; Aerotherm-75-153; EPA-600/2-75-046) Avail: NTIS HC $5.50 CSCL 13B

The technology, user experience, and cost for NOx control from stationary combustion sources are summarized along with significant sources by equipment type, fuel consumption, and annual mass emission of NOx. Combustion modifications are identified as the most advanced and effective technique for near-and far-term NOx control. Available capital and differential operating costs are given for NOx control in utility boilers by combustion modification and flue gas treatment. GRA

N76-22747# Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Colo.

AEROBIC STABILIZATION OF WASTE ACTIVATED

SLUDGE. AN EXPERIMENTAL INVESTIGATION Final Report
David B. Cohen and Donald G. Fullerton Sep. 1975 187 p refs
(Contract EPA-68-03-0152)
(PB-246593/8; EPA-600/2-75-035) Avail: NTIS HC $7.50 CSCL 13B

Metro Denver Sewage Disposal District No. 1 (Metro) in 1970 converted excess secondary aerators to aerobic digesters. The plant scale diffused air system was compared with a pilot scale open tank oxygen system using very fine bubble fixed and rotating diffusers. For the air system volatile suspended solids (VSS) reductions ranged between 11.2% and 47.2%. A significant correlation was observed between VSS reduction and detention time-temperature factor. Cold shock eliminated nitrification for a five month period. When invertebrates, particularly rotifers, comprised a significant fraction of the biomass, digestion was maximal. The pollutant concentration in the supernatant from the aerobic digester averaged 10% of that from an anaerobic digester. GRA

N76-22748# URS Research Co., San Mateo, Calif.
MATERIALS BALANCE AND TECHNOLOGY ASSESSMENT OF MERCURY AND ITS COMPOUNDS ON NATIONAL AND REGIONAL BASES Final Report
William VanHorn Oct. 1975 433 p refs
(Contract EPA-68-01-2931)
(PB-247000/3; EPA-560/3-75-007) Avail: NTIS HC $11.75 CSCL 13B

The role of mercury and its compounds in the environment and the economy of the United States was studied. A detailed material balance for mercury and its compounds was developed on a national basis and for selected geographical regions, including estimates of the environmental fate of all emissions. Current and projected process technologies for mercury products were examined, and estimates of environmental losses for 1973 and 1983 were presented. A set of regulatory alternatives was developed for each of the major technologies involving substantial losses of mercury to the environment, and the economic impact of these alternatives was examined. GRA

N76-22749# Massachusetts Univ., Amherst. Water Resources Research Center.
A REVIEW OF STATISTICAL PROCEDURES USED FOR EXAMINATION OF WATER DATA
Alan J. Gross Apr. 1975 19 p refs
(Contract DI-14-31-0001-5021)
(PB-247104/3; Completion-FY-76-6; Pub-58; W76-01509; OWRT-A-073-MASS(1)) Avail: NTIS HC $3.50 CSCL 13B

The purpose is to review conventional statistical methods which are currently in use in the analysis water quality data. The report focuses 45 articles containing statistical methodology that have been published in the last ten years. In reviewing the articles the method of annotated bibliographies is used in order that readers can ascertain specific research approaches. GRA

N76-22750# Wisconsin Univ., Madison. Water Resources Center.
WATER QUALITY CONTROL AND BUSINESS BEHAVIOR
Warren J. Bilkey Aug. 1975 23 p refs
(Contract DI-14-31-0001-5050)
(PB-247113/4; WIS-WRC-75-08; W76-01505; OWRT-A-052-WIS(1)) Avail: NTIS HC $3.50 CSCL 13B

The problem of achieving water quality control with minimal adverse economic impacts was analyzed. The adoption of water pollution abatement measures approached as an entrepreneurial type of problem in which each firm must ascertain how to adopt such measures into their operations and remain viable. Logically, then, anything which facilitates this entrepreneurial type of activity will hasten water pollution abatement. Alternatively, if this entrepreneurial type of activity fails to take place, attempts to force water pollution controls will merely drive firms out of business, with consequent unemployment and real income loss. Preparatory to designing research projects for ascertaining how to facilitate undertaking water quality controls, it seems desirable to examine the process by which firms undertake activities about which a considerable amount of information already exists. This preparatory analysis involved in-depth interviews with the managers of ten Wisconsin firms regarding water quality control and their operations. GRA

N76-22751# Research Triangle Inst., Research Triangle Park, N.C.
RANN UTILIZATION EXPERIENCE. CASE STUDY NO. 4: ECONOMIC MODELS OF WATER USE
R. G. Thompson 1975 28 p refs Prepared in part by Houston Univ.
(Contract NSF C-927)
(PB-247248/8; NSF/RA/G-75-032) Avail: NTIS HC $4.00; also included in complete report and summary, PB-247243 HC $13.00 CSCL 13B

Economic modeling of industrial water use and wastewater treatment began as a project to introduce industrial cost data and economic behavior into planning directed toward meeting demands for water and controlling water pollution by the major water-using industries: electric power generation, iron and steel manufacturing, petroleum refining, chemicals, and pulp and paper. The models developed allow identification of methods for minimizing the costs of production--when given effluent charges, prices for water, and other inputs or constraints on the production process, such as reducing the discharge of some pollutant. GRA

N76-22752# Institut National de Recherche Chemique Applique, Paris (France).
PARTICLE DETECTOR BY MECHANICAL IMPACT SENSING Final Report
Michael Benarie and Jean-Pierre Quetier Jun. 1975 77 p refs
(Contract EPA-802424)
(PB-247212/4; EPA-600/2-75-025) Avail: NTIS HC $5.00 CSCL 13B

Particulate impact has been used for the detection and measurement of raindrops and micrometeorites for several decades. Aerosols might be detected in the same way if the suspension is expanded rapidly when it enters through a capillary in a nearly evacuated vessel. If the accelerating capillary is relatively long and the pressure inside the vessel below 1 torr, particulate beams are obtained. They enable the study of particle velocities, their rebound properties, etc. For particulate beam conditions, impact sensing is mass concentration proportional, grain size and substance independent, and sensitivity may rate from the detection of single, particle to the range of mg/sq m. GRA

N76-22753# American Oil Co., Yorktown, Va.
CHEMICAL COAGULATION/MIXED-MEDIA FILTRATION OF AERATED LAGOON EFFLUENT Environmental Protection Technology Series, Jun. 1971 - Mar. 1974
J. F. Grutsch, R. C. Mallatt, and A. W. Peters Jun. 1975 114 p refs
(Grant EPA-S-803026)
(PB-247148/0; EPA-660/2-75-025) Avail: NTIS HC $5.50 CSCL 13B

Operating problems and the effect of operating variables were investigated during full scale plant operations in the scalping mode. Influent suspended solids concentration and water temperature were in the most significant independent variables. Mechanical limitations were studied, including a filter bed disturbance that necessitated a total bed replacement. High, localized backwash velocity caused the invisible disturbance which reduced turbidity removal from about 80 percent to 50 percent. Diagnostic procedures, design changes, and the costs of operation and maintenance are reported. GRA

N76-22754# Pacific Environmental Services, Inc., Santa Monica, Calif.
GUIDELINES FOR ENFORCEMENT AND SURVEILLANCE OF SUPPLEMENTARY CONTROL SYSTEMS, VOLUMES 1 AND 2 Final Report
R. J. Bryan, P. C. Kochis, J. W. Boyd, M. L. McQueary, and R. L. Norton Sep. 1975 155 p refs
(Contract EPA-68-02-1390)
(PB-247789/1; EPA-340/1-75-008) Avail: NTIS HC $6.75 CSCL 13B

Guidelines for the enforcement and surveillance of Supplementary Control Systems (SCS) are presented. These include:

A description of SCS elements and discussion of SCS violations; types of inspections and review procedures used for surveillance and enforcement; and the inspection and calibration procedures (together with sample check-lists and forms) for ambient and emission monitors and meteorological instruments. Also presented is detailed background information on inspection and calibration of SO2 ambient and emission monitors and meteorological instruments. This document is not a research report. It is designed for use by operating personnel. GRA

N76-22755# Pacific Environmental Services, Inc., Santa Monica, Calif.

GUIDELINES FOR EVALUATION OF VISIBLE EMISSIONS, CERTIFICATION, FIELD PROCEDURES, LEGAL ASPECTS, AND BACKGROUND MATERIAL Stationary Source Enforcement Series

Robert Missen and Arnold Stein Apr. 1975 132 p refs
(Contract EPA-68-02-1390)
(PB-247675/2; EPA-340/1-75-007) Avail: NTIS HC $6.00 CSCL 13B

Guidelines are provided for field procedures to follow in evaluating visible emissions from stationary sources of air pollution (Procedures are included for evaluation of nonstack emission sources such as are found in the minerals industry as well as specific stack emission sources). A visible emissions evaluator is studied regarding specific problems of applicability, including the effects of viewing conditions on opacity readings and the effects of water vapor on plume opacity. Also included are training and certification procedures for visible emissions evaluation, brief descriptions of affected process operations, general instruction on being a witness during legal proceedings involving opacity evaluations, and the use of aids in evaluating visible emissions. GRA

N76-22756# Missouri Univ., Rolla.

HEAVY METAL (Cu, Pb, Zn, Cd, Ni, As, Hg) ADDITIONS TO THE SURFACE WATERS, STREAM SEDIMENTS AND SELECTED AQUATIC LIFE IN THE MERAMEC PARK RESERVOIR DRAINAGE BASIN, MISSOURI, PHASE 1 AND 2

Paul Dean Proctor, T. Butz, and B. Sinha 29 Jul. 1975 56 p refs
(Contracts DI-14-31-0001-4025; DI-14-31-0001-5025)
(PB-247310/6; W76-01686; OWRT-A-072-MO(1)) Avail: NTIS HC $4.50 CSCL 13B

Heavy metal content of surface waters, stream and bank sediments, and selected aquatic life were determined for five distinct drainage areas in the 1,475 square miles of upper Meramec river basin. A planned reservoir will receive water and sediments from fringe mining areas producing lead, copper, zinc, cadmium, and barite. Heavy metal content in surface waters is in low parts per billion and mainly meets U.S. Public Health Service standards for drinking water. Cadmium locally approaches the upper limit of 10 ppb at six sample sites. Lead and cadmium content in waters are highest in drainage from the new lead belt fringe. Mercury is less than 0.1 ppb for all areas. GRA

N76-22757# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 13: ALLOCATING PROJECTED EMISSIONS TO SUBCOUNTY AREAS. SUPPLEMENT NO. 1: ACCOUNTING FOR NEW SOURCE PERFORMANCE STANDARDS IN PROJECTING AND ALLOCATING EMISSION - HYPOTHETICAL EXAMPLE Final Report

David Sanchez and John Silvasi Oct. 1975 43 p refs
(PB-247777/6; EPA-450/4-74-014-b-Vol-13) Avail: NTIS HC $4.00 CSCL 13B

A hypothetical example is presented of how to account for future new source performance standards in projecting and allocating emissions. The supplement also presents a general methodology for considering these future new source performance standards in the projection and allocation techniques. GRA

N76-22758# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.

STATE AIR POLLUTION IMPLEMENTATION PLAN Progress Report, 1 Jan. - 30 Jun. 1975

Sep. 1975 479 p
(PB-247682/8; EPA-450/2-75-008) Avail: NTIS HC $12.50 CSCL 13B

Data are presented for each state on the attainment status by Air Quality Control Region (AQCR) for total suspended particulate and sulfur dioxide ambient air quality monitoring, air quality maintenance areas, status of selected portions of the state implementation plans, resources (manpower and funding), compliance status of selected source categories, and enforcement actions. Over 53 and 73 percent of the AQCRs are considered likely to attain, respectively, primary TSP and SO2 National Ambient Air Quality Standards by the statutory date. GRA

N76-22759# Booz-Allen and Hamilton, Inc., Bethesda, Md.

COMPARISON OF FOUR METHODOLOGIES TO PROJECT EMISSIONS FOR THE ST. LOUIS METROPOLITAN AREA Final Report

T. J. Consroe Oct. 1975 51 p
(Contract EPA-68-02-1005)
(PB-247643/0; EPA-450/3-75-074) Avail: NTIS HC $4.50 CSCL 13B

This report describes a comparison of four alternate methodologies which were used to project air pollution emissions for the metropolitan St. Louis area. Two of the four methodologies also forecast expected ambient air quality levels. The purpose of the study was to summarize the structure and nature of each projection methodology, to compare the numerical projection results, and to discuss the relative advantages of each methodology. GRA

N76-22760# Arizona Game and Fish Dept., Phoenix.

INFLUENCE OF PUMP STORAGE AND GENERATION ON COMMERCIAL FISHERIES POTENTIAL OF RESERVOIRS Completion Report, Jun. 1972 - Jun. 1975

W. L. Minckley and Randy M. McNatt Nov. 1975 31 p refs
Sponsored by NOAA
(PB-247488/0; NOAA-75111102) Avail: NTIS HC $4.00 CSCL 13B

A compilation is presented of selected information on the impacts of pumped-storage generation installations and operations on the two, lowermost, on-river reservoirs of the Salt River chain in Central Arizona. These water storage and delivery, plus hydroelectric generating reservoirs are situated at low elevation in Lower to Upper Sonoran Desert habitats; and have been subjected to massive, and somewhat unique modifications over the past 12 years. On the basis of data presented, it appears that on-line pump - generation operations effect substantial thermal loading of downstream reservoirs. Also, disruption of the tremendous thermal stability achieved in these bodies of water prior to high levels of pump - generation operation is evident. GRA

N76-22761# Woods Hole Oceanographic Institution, Mass.

PRELIMINARY RESULTS WITH A PILOT PLANT WASTE RECYCLING MARINE-AQUACULTURE SYSTEM

John H. Ryther Sep. 1975 61 p refs
(Grants NOAA-04-4-158-5; NSF GI-43884;
NOAA-04-5-158-8)
(PB-247182/9; WHOI-75-41; NOAA-75103103) Avail: NTIS HC $4.50 CSCL 13B

A combined waste recycling marine-aquaculture system capable of complete nitrogen removal from treated domestic waste water was developed and tested on a pilot-plant scale over a one-year period. Effluent from secondary sewage treatment, mixed with seawater, is used to grow unicellular marine algae in large, continuous-flow, outdoor mass cultures. Harvest from the algae cultures is fed to oysters and other filter-feeding bivalve mollusks and to secondary crops of flounders or lobsters. Dissolved wastes produced by the animals are assimilated by cultures of commercially-valuable seaweeds. Year-round operation would be possible in tropical to semi-tropical climates. In temperate climates, operation of the system is possible only on a seasonal basis. GRA

N76-22762# Federal Energy Administration, Washington, D.C. Office of Environmental Regulations.

AN ANALYSIS OF THE IMPACT ON THE ELECTRIC UTILITY INDUSTRY OF ALTERNATIVE APPROACHES TO SIGNIFICANT DETERIORATION. VOLUME 2: TECHNICAL SUPPORT DOCUMENT

Oct. 1975 148 p Prepared in cooperation with EPA, Washington, D. C.

(PB-247385/8; FEA/D-75/691-Vol-2) Avail: NTIS HC $6.00 CSCL 13B

An evaluation is presented on the impacts that various approaches to preventing deterioration of air quality might have on the electric utility industry. It estimates the impact that EPA regulations and recent proposals by the Senate and House subcommittees could have on the size and siting of powerplants. Appendices include U.S. Environmental Protection Agency regulations for prevention of significant air quality deterioration, fundamental theory of impact prediction and the buffer zone concept, methodology for class 2 impact analysis, powerplant sample data base, selected definitions of federal lands, and sensitivity analysis of selection of public lands for designation as class 1 areas. GRA

N76-22763# West Virginia Univ., Morgantown. Dept. of Civil Engineering.

ABSORPTION OF SULFUR DIOXIDE IN SPRAY COLUMN AND TURBULENT CONTACTING ABSORBERS Final Report, Jun. 1974 - Jun. 1975

C. Y. Wen and L. S. Fan Aug. 1975 114 p refs

(Grant EPA-R-800781)

(PB-247334/6; EPA-600/2-75-023) Avail: NTIS HC $5.50 CSCL 13B

Results are given from an analysis of experimental data, from both small and large scale turbulent contacting absorbers (TCA) and spray columns used in the wet scrubbing of SO2 from flue gases, to obtain gas film mass transfer coefficients and overall coefficients in the liquid film which includes chemical reaction in the liquid film. Recycled limestone, limestone magnesium oxide, and lime scrubbing slurries were investigated. The ratio of the resistances was found to be a function of only the scrubber type, inlet SO2 partial pressure in the gas phase, slurry pH, and magnesium concentration of the scrubbing slurry. GRA

N76-22764# Scott Environmental Technology, Inc., San Bernardino, Calif.

EXPANSION OF INVESTIGATION OF PASSENGER CAR REFUELING LOSSES. THIRD-YEAR PROGRAM Final Report

Malcolm Smith and William F. Biller 30 Sep. 1975 116 p refs Sponsored by Coordinating Res. Council, Inc. and EPA

(PB-247786/7; CRC-APRAC-CAPS-9-68-3) Avail: NTIS HC $5.50 CSCL 13B

Hydrocarbon emissions during the refueling of passenger vehicles are studied. The objective was the development of a mathematical model for estimating the total hydrocarbon losses from refueling operations for an air quality control region over a specified period of time. In order that the model could be used readily by community planners and others it was based on relatively easily obtained variables such as average Reid vapor pressure of the gasolines used in the region and average underground fuel and ambient temperature. GRA

N76-22765# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

INVESTIGATING WASTE OIL DISPOSAL BY DIRECT INCINERATION Final Report

Maurice E. LePara and Gerald DeBono Feb. 1975 21 p refs

(DA Proj. 1T6-62611-AH-69)

(AD-A011236; USAMERDC-2127) Avail: NTIS CSCL 13/2

A second combustion-emissions test program was conducted at Aberceen Proving Ground, Maryland, to address the feasibility for disposal of waste oil products by direct incineration. A referee waste oil, composed primarily of automotive crank case drains, was blended into No. 2 fuel oil and combusted in a burner-boiler powerplant located at the messhall facility. During this steady-state combustion, the stack emissions were monitored by the U.S. Army Environmental Hygiene Agency to define the effects of the waste oil fraction on particulate emission rates. It was noted that particulate emissions increased significantly with the addition of the waste oil component, and indications were given that waste oil stratification could be a problem. GRA

N76-22766# Naval Biomedical Research Lab., Oakland, Calif.

HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS

L. H. DiSalvo and H. E. Guard 1975 6 p refs

(Contract N00014-69-A-0200-1001)

(AD-A011342) Avail: NTIS CSCL 13/2

Suspended sediments were obtained at seven stations in San Francisco Bay during the summer of 1974 using a double settling tube device termed the biosampler. One tube of the device passively collected suspended sediments which settled from ambient waters at the sampling sites. The top of the second tube contained bay mussels Mytilus edulis as biological agents for the active entrapment and deposition of suspended particulates occurring in the water. Presence of the mussels in the sampler was, in most cases, indispensable for collection of sufficient amounts of material for analysis over one-week sampling periods. A thin-layer chromatographic method was employed for analysis of total alkane and total aromatic hydrocarbons in recovered sediments. The sediments were found to contain 190-6,188 ppm dry weight of total hydrocarbons, with alkane-aromatic ratios varying from 1.1 to 5.1. GRA

N76-22767# Illinois Univ., Urbana. Inst. for Environmental Studies.

AN ECOSYSTEM ANALYSIS OF ENVIRONMENTAL CONTAMINATION BY LEAD

Gary L. Rolfe, Alan Haney, L. L. Getz, J. L. Hudson, and R. W. Larimore Aug. 1975 141 p refs

(Grant NSF ERT-74-24276)

(PB-248593/6; UILU-IES-75-0001) Avail: NTIS HC $6.00 CSCL 13B

An 86-square-mile watershed in east-central Illinois, predominantly agricultural with a small urban area, was studied to determine the movement of lead into and through the area. The accumulation of lead in the terrestrial and aquatic biota was also examined. Combustion of gasoline was found to be the major source of lead input, accounting for 29,000 kg per year. Of this amount, about 13,000 kg remain airborne while 16,000 kg are deposited at ground level. Lead leaves the watershed at a rate of 910 kg per year through drainage water. The balance, 14,800 kg or 92.5% of the annual input, remains within the watershed. Lead concentrations in air, soils, stream sediments and the terrestrial and aquatic biota were determined. GRA

N76-22768# Mitre Corp., McLean, Va.

IMPACT OF HYDROLOGIC MODIFICATIONS ON WATER QUALITY Final Environmental Protection Technology Series

Joginder Bhutani, Richard Holberger, Peter Spewak, Willis E. Jacobsen, and J. Bruce Truett Apr. 1975 543 p refs

(Grant EPA-R-802310)

(PB-248523/3; MTR-6887; EPA-600/2-75-007) Avail: NTIS HC $13.00 CSCL 13B

Scope and magnitude of water pollution problems are considered that are caused by hydrologic modifications. Types of pollutants released by each class of hydrologic modification are identified, and quantitative estimates are made of the amount of the major pollutant sediment-that enters the Nation's surface waters as a result of highway and urban construction. Methods for controlling the release of pollutants from hydrologic modification activities are described, and the effectiveness of sediment control measures is estimated. GRA

N76-22769# Klein (Jeffrey A.), New York.

THE ENVIRONMENTAL CONTROL INDUSTRY. AN ANALYSIS OF CONDITIONS AND PROSPECTS FOR THE POLLUTION CONTROL EQUIPMENT INDUSTRY Final Report

Kenneth Chuan-Kai Leung (Eberstadt (F.) and Co., Inc.) and Jeffrey A. Klein Dec. 1975 144 p

(Contract EQ6AC004)

(PB-248474/9; EQ-3517613004) Avail: NTIS HC $6.00 CSCL 07A

An evaluation of relevant macroeconomic and microeconomic

data is presented for environmental control equipment and analyses of emerging markets for these products and services, with primary emphasis on the pollution control industry. Direct dollar costs and benefits and the indirect costs of pollution, and benefits of pollution control are discussed. The study provides perspective on the pollution control industry's significance in terms of environmental quality and of the national economy. GRA

N76-22770# New York Univ., N.Y.
TRACE METALS IN URBAN AEROSOLS Final Report
Merrill Eisenbud and Theo. J. Kneip Oct. 1975 440 p refs Sponsored by Elec. Power Res. Inst., Palo Alto, Calif.
(PB-248324/6; EPRI-117-FR) Avail: NTIS HC $11.75 CSCL 07A

The composition of the aerosol in the New York City atmosphere is examined. Factors investigated include: concentration, trace element composition and particle size, and solubility of aerosols and settled dust in New York City, temporal patterns of the variation of trace metal and ion concentration in total suspended particulate (TSP) and settled dust; the effects of meteorological parameters on the TSP and trace element concentrations; the sources of the trace metals or ions; and the relation of the aerosol trace element compositions to human tissue burdens. GRA

N76-22771# Los Alamos Scientific Lab., N.Mex.
SCIENTIFIC MEASUREMENTS Final Report
William A. Sedlacek Jul. 1975 11 p
(Contract DOT-AS-20055)
(PB-248813/8; DOT/TST-76-13) Avail: NTIS HC $3.50 CSCL 04A

Results are presented for several different types of aerosol measurements in the lower stratosphere. The measurements were taken by equipment attached to aircraft. Also samples were taken of volcanic debris from Volcande Fuego in Guatemala. GRA

N76-22772# Illinois Univ., Urbana. Dept. of Control Engineering.
CONTROL TECHNOLOGY FOR TOXIC AND HAZARDOUS AIR POLLUTANTS Final Report
Andrew R. McFarland Dec. 1974 297 p refs Sponsored by the Illinois Inst. for Environ. Quality
(PB-247780/0; IIEQ-75-6) Avail: NTIS HC $9.25 CSCL 07B

Twenty-two air pollutants were studied from the following aspects: (1) to consider the Illinois sources from the standpoint of source identification and magnitude; (2) to determine the state-of-the-art techniques used for control of the contaminants; and (3) to estimate the costs of control. The following pollutants were considered: hydrogen chloride, hydrogen sulfide, chlorine, fluorides, bromine, hydrogen cyanide, selenium, lead, mercury, beryllium, cadmium, arsenic, nickel, manganese, magnesium, zinc, copper, vanadium, titanium, chromium, antimony, and odors. GRA

N76-22773# Brown and Caldwell, Walnut Creek, Calif.
LIME USE IN WASTEWATER TREATMENT: DESIGN AND COST DATA Final Report, 29 Jun. 1973 - 30 May 1974
Denny S. Parker, Emilio DelaFuente, Louis O. Britt, Max L. Spealman, and Richard J. Stenquist Oct. 1973 317 p refs (Contract EPA-68-03-0334)
(PB-248181/0; EPA-600/2-75-038) Avail: NTIS HC $9.75 CSCL 13B

Design and cost information is presented on lime use in wastewater treatment application considered are: Lime handling, liquid processing, solids generation and dewatering, lime recovery and ultimate ash disposal. The report takes a design manual approach so that the information presented has maximum usefulness to environmental engineers engaged in both the conceptual and detailed design of wastewater treatment plants. Design data on alternate sludge thickening and dewatering processes are presented with special emphasis on wet classification of calcium carbonate from unwanted materials and on maximizing the dewatering of wasted solids. Alternative recalcining techniques are assessed and problem areas identified. GRA

N76-22774# Environmental Monitoring and Support Lab., Cincinnati, Ohio.
RECOMMENDED DESIGN OF SAMPLE INTAKE SYSTEMS FOR AUTOMATIC INSTRUMENTATION
Richard P. Launch Nov. 1975 29 p refs
(PB-248733/8; EPA-600/4-75-012) Avail: NTIS HC $4.00 CSCL 13B

Pumping systems for automatic water quality monitors are discussed, and recommendations on sample change, residence time, site selection, pipe size, pump selection, system cleaning, and overall design are given. Experimental data showing sample degradation because of biological metabolism, cavitation, and aeration are presented. A recommended system to overcome past problems is presented and alternative approaches for system installation are also shown. GRA

N76-22775# Environmental Protection Agency, Philadelphia, Pa. Water Supply Branch.
WATER TREATMENT PLANT PROCESSES AND OPERATIONS
James F. Manwaring and Ramon G. Lee May 1974 79 p refs
(PB-248137/2; EPA-903/9-75-021) Avail: NTIS HC $5.00 CSCL 13B

The report is in the form of a training course manual prepared for plant operators and regulatory personnel involved in surveillance of drinking water treatment facilities. GRA

N76-22776# Environmental Protection Agency, Washington, D.C. Library Systems Branch.
EPA REPORTS BIBLIOGRAPHY QUARTERLY: A LISTING OF EPA REPORTS ENTERED INTO THE NATIONAL TECHNICAL INFORMATION SERVICE, OCTOBER - DECEMBER 1975
1975 87 p
(PB-242075-04) Avail: NTIS HC $15.00/MF $15.00; Paper copy also available on subscription $45.00/year domestic, $60.00/year foreign CSCL 13B

A bibliography is presented which contains citations, abstracts and author, corporate source, subject, contract, and title indexes for all U.S. Environmental Protection Agency and its predecessor agencies' reports entered into the NTIS collection in the period noted. The original bibliography, and the first and second supplements should provide sufficient information for any user to identify any EPA report desired. GRA

N76-22777# Iowa State Water Resources Research Inst., Ames.
EFFECTS OF LARGE THERMAL DISCHARGES ON ICE-COVERED RIVERS Completion Report, Jul. 1972 - Jun. 1975
P. P. Paily, J. F. Kennedy, E. O. Macagno, and G. Dagan Sep. 1975 16 p
(Contracts DI-14-31-0001; DI-14-31-0001-3956)
(PB-248712/2; ISWRRI-68; W76-03139; OWRT-B-034-IA(1)) Avail: NTIS HC $3.50 CSCL 13B

The effects of large thermal discharges on ice-covered rivers were investigated analytically, numerically, and experimentally. Field investigations were also performed to compare the theoretical results. The study was conducted in two phases. During the first phase, the thermal response of rivers to hot water discharges under cold period conditions was investigated. A numerical solution for the general case and a closed form solution for a particular case were developed to determine the water temperatures and lengths of ice free reaches for various combinations of climatic and thermal discharge conditions. During the second phase of the study, the effects of thermal discharges on melting rates of ice covers were investigated theoretically and experimentally. GRA

N76-22778# Lake Michigan Cooling Water Studies Panel, Chicago, Ill.
A STATEMENT OF CONCERNS AND SUGGESTED ECOLOGICAL RESEARCH
Caldwell D. Meyers and Karl E. Bremer Nov. 1975 387 p refs
(PB-248131/5; EPA-905/3-75-001) Avail: NTIS HC $10.75 CSCL 13B

The effects of cooling water use on Lake Michigan are considered. The introductory considerations of Lake Michigan are presented in the first section. The second section presents recommendations toward objective quantification of the effects

of cooling water use through proper statistical planning, study design, and data collection. The remaining seven sections relate information basic to an understanding of the effects of cooling use on physical and chemical aspects, primary producer and consumer communities, macrozoobenthos, fishery, entrapped and entrained organisms, and radioecology of Lake Michigan.
GRA

N76-22779# Rutgers Univ., New Brunswick, N.J. Center for Urban Policy Research.
EMISSION DENSITY AND ALLOCATION PROCEDURES FOR MAINTAINING AIR QUALITY
R. K. Brail, D. R. Mandelker, T. A. Sherry, and G. Hagevik Jun. 1975 104 p refs
(Contract EPA-68-02-0278)
(PB-248773/4; EPA-450/3-75-079) Avail: NTIS HC $5.50 CSCL 13B

The ratio of the mass of an air pollutant emitted per unit of land area in any given time interval forms the basis of emission control regulations based on land area. This report examines four types of such regulations: Emission allocations, floating zone emission quotas, district emission quotas, and emission density zoning. Experience with floating zone emission quotas in Jefferson County, Kentucky and with emission density zoning in Cook County, Illinois is examined. Legal issues relating to equal protection and due process, and methodological concerns relating to the integration of land use planning and air pollution control, are discussed.
GRA

N76-22780# Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: CHLORINATED PARAFFINS
Philip H. Howard, Joseph Santodonato, and Jitendra Saxena Nov. 1975 122 p refs
(Contract EPA-68-01-3101)
(PB-248634/8; SURC-TR-75-622; EPA-560/2-75-007) Avail: NTIS HC $5.50 CSCL 13B

Potential environmental hazards from the commercial use of chlorinated paraffins are reviewed. Chlorinated paraffins, in most cases, contain 10 to 30 carbon atoms and a chlorine content of 40-70%. They are used as lubricating oil additives, secondary plasticizers, and flame retardants. Information on physical and chemical properties, production methods and quantities, commercial uses and factors affecting environmental contamination, as well as information related to health and biological effects, are also reviewed.
GRA

N76-22781# California Univ., Los Angeles. School of Architecture and Urban Planning.
ENVIRONMENTAL MANAGEMENT IN THE MALIBU WATERSHED: INSTITUTIONAL FRAMEWORK Final Socioeconomic Environmental Studies
W. David Conn Jun. 1975 109 p refs
(Grant EPA-R-802836)
(PB-248645/4; EPA-600/5-75-018) Avail: NTIS HC $5.50 CSCL 13B

On the basis that the nature and scale of permitted development is likely to be the major factor shaping the future environment of the study area, an attempt is made to identify and assess the roles of both those agencies that play a positive role in promoting development and those that constrain and regulate development. Roles are examined for particular government agencies in planning and decision-making processes affecting different elements of the environment (e.g., land-use, coastal resources, air quality, etc.). It then approaches the subject from a different perspective, studying the involvement of a number of institutions in particular projects or sets of projects.
GRA

N76-22782# Environmental Research Lab., Duluth, Minn.
COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE Final Report
John W. Arthur, Robert W. Andrew, Vincent R. Mattson, Donald T. Olson, and Gary E. Glass Nov. 1975 73 p refs
(PB-248653/8; EPA-600/3-75-012) Avail: NTIS HC $4.50 CSCL 13B

Flow-through laboratory bioassays were conducted with a domestic secondary sewage effluent that was disinfected by chlorination, by chlorination followed by dechlorination, and by ozonation. Effluent without disinfection served as a control. Disinfection with chlorine and ozone generally maintained the effluent at total coliform levels of less than 1,000 per 100 ml. Lake Superior water served as the diluent source for the experiments. Short-term exposures were conducted with 13 species (seven fish and six invertebrates), and long-term (generation) tests were performed with three species (one fish and two invertebrates). In both series of tests, the chlorinated effluent was lethal at appreciably lower concentrations than any of the other three effluent treatments.
GRA

N76-22783# National Environmental Research Center, Las Vegas, Nev.
NATIONAL EUTROPHICATION SURVEY METHODS, 1973-1976 Final Report
Jun. 1975 99 p refs
(PB-248886/4; Working-Paper-175) Avail: NTIS HC $5.00 CSCL 13B

Chemical, physical, and biological methods and other procedures used by the U.S. Environmental Protection Agency's National Eutrophication Survey are detailed. These procedures were used during the last three years of the survey in lake, stream, and municipal sewage treatment plant sampling and analysis.
GRA

N76-22784# Naval Academy, Annapolis, Md. Energy-Environment Study Group.
SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENT Final Report, 1 Jul. - 30 Aug. 1974
Jerome Williams 10 Oct. 1975 15 p refs
(TF57572001)
(AD-A018278; USNA-EPRD-16) Avail: NTIS CSCL 08/10

A mathematical light scattering model previously developed by the author sums the attenuating effects of a stack of particles containing 'plates'. One of the unknown quantities in this model is the relative amount of light scattered in a backward direction by each particle. By considering the effects of multiple scattering, the portion of light scattered in a backward direction is calculated and turbidity paramaters are then easily related to the relative irradiance loss coefficient and the attenuation coefficient. These are directly obtainable from photometer and Secchi disc measurements. Data are presented from the Chesapeake Bay which compare average particle size and total suspended load as determined by laborious visual counting and sizing techniques and by direct calculation from photometer and Secchi disc measurements.
GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N76-22785 California Univ., Los Angeles.
UPPER TROPOSPHERIC WAVES IN THE TROPICS AND THEIR ASSOCIATION WITH CLOUDS IN THE WAVENUMBER-FREQUENCY DOMAIN Ph.D. Thesis
Abraham Zangvil 1975 145 p
Avail: Univ. Microfilms Order No. 76-8285

The large-scale wind field at the 200 mb level and the associated cloud field in the latitude belt 20 deg. to 40°S N were studied using wind and satellite measured brightness data for the period June-August 1967. Space-time power spectrum analysis was employed to determine the dominant space and time scales of disturbances in the wind and cloud field. Space-time cross-spectrum analysis was used to deduce the meridional momentum and energy transports of transient waves and the association of the wind and cloud fields in the wavenumber-frequency domain. The wave modes detected were: (1) eastward-propagating Kelvin-type waves, (2) a westward-propagating mixed Rossby-gravity wave, and (3) a westward-propagating Rossby wave. Cloud activity has a pronounced maximum at

10 deg N. The dominant scale at this latitude for westward-moving waves is of s approximately equal to 10 and period 5 days. The dominant cloud activity at s approximately equal to 10 is confined mainly to regions of high sea surface temperature. Dissert. Abstr.

N76-22786 California Univ., San Diego.
THEORY OF IONOSPHERIC HEATING EXPERIMENTS Ph.D. Thesis
Bruce Leonard Cragin 1975 123 p
Avail: Univ. Microfilms Order No. 76-7805

A theory for the phenomenon of artificial spread F is represented. The explanation is in terms of scattering by approximately field-aligned, large scale ionization density irregularities, which are produced by a thermal version of the stimulated Brillouin scattering instability in which the heating wave decays into another electromagnetic wave and the electrostatic wave of very low frequency. This thermal instability differs from conventional stimulated Brillouin scattering in that the low-frequency wave is driven by differential heating in the interference pattern of the two electromagnetic waves, rather than by the usual ponderomotive force. Some aspects of the theory of the phenomenon of wide-band attenuation or anomalous absorption of a probing electromagnetic wave are also discussed. Dissert. Abstr.

N76-22787*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
LOW LATITUDE MIDDLE ATMOSPHERE IONIZATION STUDIES
Joseph Peter Bassi May 1976 67 p refs
(Grants NGR-39-009-218; NsG-6004)
(NASA-CR-147141; PSU-IRL-IR-56) Avail: NTIS HC $4.50 CSCL 04A

Low latitude middle atmosphere ionization was studied with data obtained from three blunt conductivity probes and one Gerdien condenser. An investigation was conducted into the effects of various ionization sources in the 40 to 65 Km altitude range. An observed enhancement of positive ion conductivity taking place during the night can be explained by an atmsopheric effect, with cosmic rays being the only source of ionization only if the ion-ion recombination coefficient (alpha sub i) is small(< 10 to the -7 power cu cm/s) and varies greatly with altitude. More generally accepted values of alpha sub i (approximately equal to 3x10 to the -7 power cu cm/s) require an additional source of ionization peaking at about 65 Km, and corresponding approximately to the integrated effect of an X-ray flux measured on a rocket flown in conjunction with the ionization measurements. The reasonable assumption of an alpha sub i which does not vary with altitude in the 50-70 Km range implies an even greater value alpha sub i and a more intense and harder X-ray spectrum. Author

N76-22788*# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
THREE-DIMENSIONAL DYNAMICAL AND CHEMICAL MODELLING OF THE UPPER ATMOSPHERE Semiannual Status Report, 1 Sep. 1975 - 29 Feb. 1976
Ronald G. Prinn, Fred N. Alyea, and Derek M. Cunnold 29 Feb. 1976 67 p refs
(Grant NsG-2010)
(NASA-CR-147102) Avail: NTIS HC $4.50 CSCL 04A

Progress in coding a 3-D upper atmospheric model and in modeling the ozone perturbation resulting from the shuttle booster exhaust is reported. A time-dependent version of a 2-D model was studied and the sulfur cycle in the stratosphere was investigated. The role of meteorology in influencing stratospheric composition measurements was also studied. Author

N76-22789*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKETCH OF A UNIFYING AURORAL THEORY
Walter Lennartsson Nov. 1975 59 p refs
(NASA-TM-X-64998) Avail: NTIS HC $4.50 CSCL 04A

On the basis of field and particle observations, it is suggested that a bright auroral display is a part of a magnetosphere-ionosphere current system which is fed by a charge-separation process in the outer magnetosphere (or the solar wind). The upward magnetic-field-aligned current is flowing out of the display, carried mainly by down-flowing electrons from the hot-particle populations in the outer magnetosphere (the ambient cold electrons being depleted at high altitudes). As a result of the magnetic mirroring of these downflowing current carriers, a large potential drop is set up along the magnetic field, increasing both the number flux and the kinetic energy of the precipitating electrons. It is found that this simple basic model, when combined with wave-particle interactions, may be able to explain a highly diversified selection of auroral particle observations. It may thus be possible to explain both inverted-V events and auroral rays in terms of a static parallel electric field, and the electric field may be compatible with a strongly variable pitch-angle distribution of the precipitating electrons, including distributions peaked at 90 deg as well as 0 deg. This model may also provide a simple explanation of the simultaneous precipitation of electrons and collimated positive ions. Author

N76-22790*# Joint Publications Research Service, Arlington, Va.
RADIATION RESEARCH IN THE ATMOSPHERE
Washington NASA May 1976 148 p refs Transl. into ENGLISH from Tr. 331, Gl. Geofiz. Observ. (Leningrad), 1975 p 1-133
(NASA Order W-13183)
(NASA-TT-F-16927) Avail: NTIS HC $6.00 CSCL 04A

The articles in this collection present the results of theoretical and experimental investigations of radiation processes in the atmosphere. The subjects that are discussed include the spectral and integral radiation characteristics of a cloudy atmosphere and the radio frequency radiation of a vartically heterogeneous medium, soils, and a disturbed sea. There is also some discussion of problems related to radiation receiver research and problems in pyrheliometry. Author

N76-22791*# California Inst. of Tech., Pasadena.
THE GENERATION OF GRAVITATIONAL WAVES. 2. THE POST-LINEAR FORMALISM REVISTED
Ronald J. Crowley (Calif. State Univ., Fullerton) and Kip S. Thorne Apr. 1976 33 p refs Submitted for publication
(Grants NGR-05-002-256; NSF AST-75-01398)
(NASA-CR-147215; OAP-450) Avail: NTIS HC $4.00 CSCL 08N

Different versions of the Green's function for the scalar wave equation in weakly curved spacetime are compared and contrasted and their mathematical equivalence is demonstrated. Then the DeWitt-DeWitt Green's function is used to construct several alternative versions of the Thorne-Kovacs post-linear formalism for gravitational-wave generation. Finally it is shown that, in calculations of gravitational bremsstrahlung radiation, some of the presented versions of the post-linear formalism allow one to treat the interacting bodies as point masses, while others do not. Author

N76-22792# Polish Academy of Sciences, Warsaw.
ARTIFICIAL SATELLITES, VOLUME 10, NO. 1
Dec. 1975 72 p refs
Avail: NTIS HC $4.50

Articles are presented dealing with the occurrence and characteristics of ionospheric irregularities. Scintillation theory and transmission of satellite signals are among the topics discussed. For individual titles, see N76-22793 through N76-22798.

N76-22793 Polish Academy of Sciences, Warsaw.
PARTICLE FLUX FROM THE PROTONOSPHERE AS A POSSIBLE CAUSE OF THE IONOSPHERIC STORM INCREASE OF TOTAL ELECTRON CONTENT
Wojciech Domoslawski *In its* Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 1-10 refs (For availability see N76-22792 13-46)

Total electron content measurements have shown the appreciable increase around 17.00-18.00 LT during magnetic storms. It is assumed that the effect is caused by the plasmapause compression in the afternoon sector and enhancement of the protonospheric particles flux. Such enhancement changes the distribution of electron concentration. The main mechanism of electron redistribution is plasma diffusion. Based on the measured total electron content changes the particle flux from the

protonosphere is estimated at 2,000 km altitudes during the storm initial phase. Author

N76-22794 Institute of Space Research, Moscow (USSR).
INVESTIGATION OF IONOSPHERIC IRREGULARITIES BY PROBING TECHNIQUE
Genadij Gdalevich *In* Polish Acad. of Sci. Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 11-16 refs (For availability see N76-22792 13-46)

Satellite and rocket methods of investigating ionospheric irregularities are described. Results are given of measurements obtained by the third Soviet artificial earth satellite in 1958. Author

N76-22795 Polish Academy of Sciences, Warsaw.
OCCURRENCE AND CHARACTERISTICS OF SPREAD F IRREGULARITIES MANIFESTED IN GROUND-BASED MEASUREMENTS
Zbigniew Klos *In its* Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 17-23 refs (For availability see N76-22792 13-46)

A short discussion of typical morphological properties of spread F occurrence is given, followed by a brief characterization of spread F irregularity structure resulting from the mentioned investigations. A review presenting the most important results of studies devoted to the spread F irregularity is given. Author

N76-22796 Ceskoslovenska Akademie Ved, Prague.
ON THE INTERPRETATION OF SCINTILLATIONS OF GEOSTATIONARY SATELLITE SIGNALS IN MIDDLE LATITUDES **c17**
Ludmila Triskova *In* Polish Acad. of Sci. Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 25-35 refs (For availability see N76-22792 13-46)

Some possibilities are shown to determine parameters of chosen model of inhomogeneities under the phase screen approach when evaluating measurements of scintillations of geostationary satellite signals in middle latitudes. The limitations of validity of the obtained quantities are mentioned. Author

N76-22797 Polish Academy of Sciences, Warsaw.
APPLICATION OF THE SCINTILLATION THEORY TO IONOSPHERIC IRREGULARITIES STUDIES
Andrzej W. Wernik and Chao H. Liu (Illinois Univ., Urbana) *In its* Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 36-58 refs Presented at Symp. on Beacon Satellite Investigations of the Ionospheric Structure and ATS-F Data, Moscow, 25-29 Nov. 1974 (For availability see N76-22792 13-46)

A review is presented of the present status of the scintillation theory. The limitations of the single scattering theory and some other assumptions of the scintillation theory are discussed. Formulas relating the measured parameters to the properties of the scattering medium are given. The numerical solution of the fourth moment equation for the field make it possible to account for the multiple scattering effects. Limitations of the observational methods and difficulties in the data interpretation are discussed. Author

N76-22798 Technical Univ. of Wroclaw (Poland).
GROUND RECEIVING EQUIPMENT FOR METEOROLOGICAL SATELLITES OPERATING IN THE 137 MHz FREQUENCY BAND **c17**
Daniel J. Bem *In* Polish Acad. of Sci. Artificial Satellites, Vol. 10, No. 1 Dec. 1975 p 61-75 refs (For availability see N76-22792 13-46)

Ground receiving equipment is described for meteorological satellites operating in the 137 MHz frequency band. Author

N76-22799# Sandia Labs., Albuquerque, N.Mex.
CLOSE-IN MAGNETIC FIELDS OF A LIGHTNING RETURN STROKE
R. D. Jones and H. A. Watts Jun. 1975 34 p refs
(Contract AT(29-1)-789)
(SAND-75-0114) Avail: NTIS HC $4.75

The method of images is used to determine the time history of the close in magnetic field environment resulting from a lightning return stroke at a point on the earth's surface and at altitudes of 2,000 and 4,000 meters. The lightning channel is modeled after Uman and McLain, and a Dennis and Pierce-type current distribution in the channel is assumed. Particular attention is given to the initial lightning return stroke, in which the velocity of stroke propagation is time varying. A constant velocity of stroke propagation is used for subsequent return strokes. Results obtained from a simplified model are compared with those obtained from a model using retarded potentials. For close-in environments, excellent agreement is obtained between the two treatments. Some observations are made about the magnetic field variation with respect to altitude and the distance of the observer from the stroke, and a versatile, easily used computer code applicable to a wide range of lightning parameters is described. Author (ERA)

N76-22800# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
A POSSIBILITY FOR DISTINGUISHING MAGNETOSPHERIC AND IONOSPHERIC MAGNETIC FIELD DISTURBANCES NEAR THE MAGNETIC EQUATOR [EINE MOEGLICHKEIT ZUR UNTERSCHEIDUNG VON MAGNETOSPHAERISCHEN UND IONOSPHAERISCHEN MAGNETFELDSTOERUNGEN IN DER NAEHE DES MAGNETISCHEN AEQUATORS]
Ioannis Papamastorakis Jun. 1975 149 p refs In GERMAN (MPI-PAE/Extraterr-111) Avail: NTIS HC $6.00

The possibility of distinguishing these disturbances and separating both contributions in the case of mixed disturbances was investigated using magnetograms produced by Indian magnetic observatories. The basic concept was that beneath the equatorial electrojet the ionospheric field has a stronger variation in the north-south direction than the magnetospheric fields. Currents are induced in conductive earth layers, mainly the ocean, the magnetic field of which adds to the primary field of the disturbance and shows a different configuration along the coast as a function of either ionospheric or magnetospheric disturbance. The data, available from only three stations, proved insufficient for any far reaching conclusions. Proposals are made for extension of the investigation. ESA

N76-22801# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany). Inst. fuer Ionosphaerenphysik.
THE SOUTHERN BOUNDARY REGION OF THE WINTER ANOMALY IN IONOSPHERIC ABSORPTION IN WINTER 1971/72 OBSERVED ON BOARD A SHIP BETWEEN 10 AND 55 DEG N
W. Barke, W. Elling, K. H. Geisweid, G. Heimesaat, A. Loidl, C. Roemer, H. Schwentek, and R. Zellermann Berlin Springer Verlag 1974 34 p refs
(Rept-51/1974; ISBN-3-540-06660-8) Avail: NTIS HC $4.00

In the period 28 November 1971 to 12 February 1972, during three passages of the North Atlantic, the diurnal variation of ionospheric absorption L was measured by method A1 at 1.7 and 5.0 MHz as a function of geographic and geomagnetic parameters. The measurements were carried out, applying a new equipment especially designed for mobile expeditions, onboard a cargo vessel moving between Hamburg and La Guaira. Simultaneously, in the framework of the European cooperation on winter anomaly studies, measurements of absorption were made at various other locations and the data used as a basis for comparison. Aboard, the diurnal variation of absorption showed large modifications from day to day. The behavior of L (cos x = 0.2) was somewhat different at each passage but showed a common trend. The winter anomaly vanished in a transit zone between 34 deg N and 44 deg N centered at about 39 deg N; the same was true for the behavior of L (cos x = 1). The measurements made at 5 MHz, in general, supported those at 1.7 MHz. A comparison of the trends of absorption at measuring stations and the ship showed rather complicated and varying correlations. Author (ESA)

N76-22802# Technical Univ. of Denmark, Lyngby. Ionosphere Lab.
THE FARLEY INSTABILITY AND THE POLAR CAP E-FIELD
F. Primdahl, J. K. Olesen, and F. Spangslev Nov. 1974 15 p refs
Avail: NTIS HC $3.50

The theoretical distributions over the polar cap of the growth rates of the gradient and the Farley-Buneman two-stream instabilities are compared to the measured distribution of the

Slant E Condition (SEC) on polar cap ionograms. The Farley instability seems the most likely source of the SEC and this opens the possibility by means of ground based ionospheric Doppler radars of detecting whether the polar cap E-field is above or below a critical field and, if above, of determining the direction of the E-field and the magnitude of the critical field.
Author (ESA)

N76-22803# Danish Space Research Inst., Lyngby.
ON THE RELATION OF THE SLANT E CONDITION (SEC) IN POLAR CAP IONOGRAMS TO THE SOLAR WIND SECTOR STRUCTURE
N. DAngelo and J. K. Olesen (Tech. Univ. of Den.) 1974 17 p refs
Avail: NTIS HC $3.50

The Slant E Condition (SEC) at Godhavn (Greenland) is shown to correlate with the solar wind sector structure, the occurrence rate of SEC being large a few days after passage of a sector boundary and declining in the trailing part of the sector. Analysis of SEC occurrence in terms of the solar wind velocity, Vsw measured on board HEOS-2 indicates that nearly no SEC occurs when Vsw is less than 350 - 400 km/s (in apparent agreement with the interpretation of SEC in terms of the Farley-Buneman instability). Author (ESA)

N76-22804# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ELECTRIC FIELDS AND ENERGETIC PARTICLE PRECIPITATION IN AN AURORAL ARC
T. Edwards, D. A. Bryant, M. J. Smith, U. Fahleson, C.-G. Faelthammar, and A. Pedersen 1975 11 p refs Presented at the Summer School on Magnetospheric Particles and Fields, Graz, 4-15 Aug. 1975 Sponsored in part by Swed. Board for Space Activities Prepared jointly with Appleton Lab. and ESTEC
(TRITA-EPP-75-26) Avail: NTIS HC $3.50

Preliminary results from a rocket flight across a single discrete auroral arc extending from early evening to magnetic midnight are presented. The rocket, fired at the end of the growth phase of an isolated auroral substorm, carried a separating payload to simultaneously measure electrons (0.6 - 25 keV, pitch angle 0 - 60 deg) at two points. From the main vehicle the electric field vector and plasma parameters were measured. The electron spectra were hardest towards the center of the arc, where the peak intensity was at 9.5 keV. The precipitation structure observed was similar to that of an 'inverted V' but smaller. The electric field, reaching a maximum of about 50 mV/m some distance north of the arc, was northward south of the arc, southward within the arc and somewhat north of it, then again northward. At the northern edge of the precipitation region the field was very irregular. Author (ESA)

N76-22805# Kiruna Geophysical Inst. (Sweden).
AURORAL EMISSIONS IN RELATION TO LOW ENERGY ELECTRON FLUX IN THE NIGHTSIDE AURORAL OVAL
G. Gustafsson and A. Egeland (Norweg. Inst. of Cosmic Phys.) Aug. 1975 18 p refs Submitted for publication
(KGI-Preprint-75-303) Avail: NTIS HC $3.50

Analysis of particle and photometer data from ESRO 1A (Aurorae) shows (in agreement with several other studies) that the ratio of integrated auroral intensity at 4278 A and particle precipitation is constant (with + or - 50 per cent) and more or less independent of the particle energy spectrum. However, in several cases it is found that the electron flux below approximately 2 - 3 keV at satellite altitude (400 to 700 km) is not important in the production of auroral ionized molecular nitrogen emission as observed from the satellite. These facts can be explained either by marked change in composition and/or density in the auroral E-region during disturbed conditions, or by backscattering/ reflection of low energy electrons above 150 km due to significant potential differences parallel to the earth magnetic field at auroral latitudes. It is argued that the latter explanation is most likely. Author (ESA)

N76-22806# Tubingen Univ. (West Germany). Inst. fuer Astronomie.
A METHOD FOR PRECISE DETERMINATION OF THE VOLTAGE BETWEEN IONOSPHERE AND GROUND
H. J. Fischer and R. Muehleisen Mar. 1975 33 p refs
Avail: NTIS HC $4.00

The electric voltage can be determined by integration of the measured electric field as a function of the height in the atmosphere. The procedure of the field measurement in the free atmosphere is presented and described. It requires an exact measurement of the electric field from the ground up to an altitude of about 10 km using one or two balloons hung up by means of well insulating ropes and two radioactive probes installed at the upmost and lowest end of the apparatus as sensors. Sources of errors are discussed and instructions given to reduce the total error of the electric voltage between ionosphere and ground below + or - 5 %. A classification scheme is introduced for the critical determination of the accuracy. ESA

N76-22807# European Space Agency, Paris (France).
MEASUREMENT OF SHORT-WAVE RADIATION FLUXES IN THE FREE ATMOSPHERE BY MEANS OF A 4-CHANNEL RADIO-SONDE AND AUTOMATIC PROCESSING OF THE RESULTS
Heinz Queck et al Dec. 1975 49 p refs Transl. into ENGLISH of 'Messung kurzwelliger Strahlungsstroeme in der freien Atmosphaere mittels 4-Kanal-Radiosonde u. autom. Aufbereitung der Ergeb.', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-Mitt-73-13, 7 Mar. 1973 Original German report available from DFVLR, Porz, West Ger. DM 15.70
(ESA-TT-231; DLR-Mitt-73-13) Avail: NTIS HC $4.00

A method is described for attenuating radiation data obtained from a special radiosonde and stored on magnetic tape. The basic equations for determining turbidity are given. The computer program described is in three parts. In the first part, the reference frequencies and reference levels are determined, and the measured frequencies are filtered. In the second part the pressure-time relation is transformed into a pressure-height relation using the latest available routine (TEMP) radio-sonde ascent. In the third part, using the parameters of the calibration functions already determined and the time-pressure relation, the radiation values are computed and converted for a zenithal position of the sun. An illustrative example is given. Author (ESA)

N76-22808# International Centre for Earth Tides, Brussels (Belgium).
TRANS WORLD TIDAL GRAVITY PROFILE Final Report, 1 Jun. 1973 - 30 Jun. 1975
P. Melchior and B. Ducarme 1 Sep. 1975 58 p refs
(Grant AF-AFOSR-2557-73; AF Proj. 8607)
(AD-A016366; AFCRL-TR-75-0499) Avail: NTIS CSCL 08/5

This report discusses the theoretical aspects of a fundamental earth tide measuring station; operational aspects of trans world tidal gravity profiles results obtained in nine Asiatic stations, data recorded in Australia. GRA

N76-22809# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
ALTERATIONS OF FLOW CHARACTERISTICS WITHIN GEOTHERMAL AREAS BY TIDAL FORCES
John S. Rinehart 10 Jun. 1975 16 p refs
(Grant NSF AER-74-03429)
(PB-247190/2; CUMER-75-6; NSF/RA/N-75-127) Avail: NTIS HC $3.50 CSCL 08G

The state of strain within the earth is undergoing constant temporal and spatial changes that modify permeabilities and pore pressures, the regulators of the flow of fluids through rock masses. Any change in the state of strain can be expected to influence flow. Some important sources of the stresses producing strains are tidal forces, thermal forces, alterations in mechanical structure, and chemical reactions. Effects of tidal forces are the easiest to analyze since they can be calculated precisely. It is shown in this report how tidal forces will alter the flow characteristics of certain plausible models of geothermal systems. GRA

N76-22810# Michigan State Univ., East Lansing. Dept. of Civil Engineering.
A FIELD STUDY ON THE RELATIONSHIP OF TEMPERATURE AND ICE TO INFILTRATION AT A SPRAY IRRIGATION FACILITY Completion Report, Jul. 1974 - Sep. 1975
Ted S. Vinson and Bruce E. Davison Sep. 1975 120 p refs
(Contract DI-14-31-0001-3522)

(PB-247516/8; MSU-CE-75-2; W76-01810; WRT-A-079-MICH(1)) Avail: NTIS HC $5.50 CSCL 13B

The purpose of this research program is to investigate changes in infiltration and percolation characteristics of soils with subfreezing temperatures, snow cover, and ice buildup. Data on air, surface and ground temperatures, and infiltration was collected from three sites at a spray irrigation area during the first winter spray program. Two contiguous sites received six spray applications during the winter months. A third site was used as a control site and received no spray application. Spray application was measured by nonweighing rain gauges. Infiltration was monitored by three lysimeters at depths of approximately 1.0 ft., 3.0 ft., and 5.0 ft. at each site. GRA

N76-22811# Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

EVALUATING THE IMPACT OF STRUCTURALLY INTERRUPTED FLOOD PLAIN FLOWS

Dwight A. Sangrey, Peter J. Murphy, and John L. Nieber Oct. 1975 32 p refs

(Contract DI-14-31-0001-5032)

(PB-247552/3; W76-01808; TR-98; OWRT-A-059-NY(1)) Avail: NTIS HC $4.00 CSCL 13B

A procedure has been developed for predicting the interaction of flood waters and structures on the flood plain. Using the results of the hydrodynamic model a procedure is described for estimating the loads on flood plain structures. A nondimensionalized form of the loading has been useful in predicting structural damage. A case study involving modeling of a flood plain for comparison with damage resulting from Tropical Storm Agnes is reported. The damage survey of a random sample of 155 flood plain structures is particularly useful for evaluation of flood damage criteria. A damage criterion has been proposed based on these data. GRA

N76-22812# Nebraska Univ., Lincoln. Agricultural Meteorology Section.

TERRESTRIAL SOURCE AND SINK STRENGTHS FOR ATMOSPHERIC CARBON DIOXIDE IN AN AGRICULTURAL REGION Progress Report

Shashi B. Verma and Norman J. Rosenberg Sep. 1975 107 p refs

(Grant NOAA-2-35385)

(PB-247120/9; Agr-Meteorol-PR-75-2; NOAA-75102909) Avail: NTIS HC $5.50 CSCL 04A

The results of studies to quantify the terrestrial source and sink strengths for atmospheric carbon dioxide in an agricultural region are reported. Atmospheric carbon dioxide concentration and gradients representative of a large agricultural region are being monitored at Mead, Nebraska with infrared gas analyzers. A meteorological tower is equipped with sampling intakes at various elevations up to 16 m through which air is drawn to the laboratory for analysis. An automatic calibration system has been developed to permit hourly checks of analyzer performance. Profiles of wind speed and air temperatures are also measured. GRA

N76-22813# George Washington Univ., Washington, D.C. Inst. for the Study of Fatigue Fracture and Structural Reliability.

CONSTITUTIVE EQUATIONS OF ROCK WITH SHEAR DILATANCY Final Technical Report

Alfred M. Freudenthal Apr. 1975 54 p refs

(Grant DA-ARO(D)-31-124-73-G194)

(AD-A011402; ARO-11378.2-E) Avail: NTIS CSCL 08/7

Coupling between dilatation and shear stress referred to as dilatancy, has been shown to be a significant feature of rocks. Relations required for the interpretation of test results in the light of this theory are derived. It is shown that dilatancy in rocks is not the result of cracking at compressive stresses below the limit of shear failure, but its cause. Shear induced density gradients of physically significant magnitude are believed to provide the key to the understanding of important aspect of the behavior of rocks and rock-like solids. Thus, the order of magnitude of the shear dilatancy coefficient on granite, derived from experimental records, appears to justify the conclusion that the observed form of the promonitory variation of the P-wave velocity/S-wave velocity ratio is the result of the decrease in V sub p caused by dilatancy increase accompanying the build-up of tectonic shear forces preceding an earthquake, followed by increase of V sub p due to build-up of confining pressure at impending shear failure by restraint of the rapidly increasing dilatancy. GRA

N76-22814# Oklahoma Univ., Norman.

RHEOLOGICAL PROPERTIES OF FROZEN SOILS Final Report

Robert G. Rein, Jr. and Cedomir M. Sliepcevich 28 Feb. 1975 122 p refs

(Grants DAHC04-74-G-0117; DA-ARO(D)-31-124-72-G0117) (AD-A011459; ARO-10302.2-EN; Rept-1827-1978-FR-1) Avail: NTIS CSCL 08/13

Results for creep tests during uniaxial, unconfined compressive loading of a frozen silt at -9 C, a frozen sand at -8.5 C, and two other frozen sands at -9 C are presented. Results of creep recovery tests on a frozen silt and a frozen sand are also reported. In order to elucidate soil behavior for modeling long-term creep deformation, the data are analyzed in terms of stress-strain behavior at constant times. The stress-strain behavior prior to tertiary creep is best represented by bisectional relations, instead of the usual continuous relations. Equations are presented for modeling the creep behavior for a single application of a constant load. GRA

N76-22815# Western Illinois Univ., Macomb. Policy Research Inst.

FLOOD HAZARD AND PATTERNS OF URBAN DEVELOPMENT IN THE UPPER MIDWEST

Daniel Singer and Norman Walzer Jan. 1975 146 p refs

(Contract DACW25-75-C-0010)

(AD-A011338) Avail: NTIS CSCL 13/2

This study was undertaken to examine the relationships between the economic structure in urban areas subject to flood hazard and their flood damage potential in order to develop a systematic methodology for forecasting future flood damage. As a byproduct of this analysis, insight into alternative policies controlling flood plain development was obtained. Topics discussed include the following: patterns of economic development, flood hazard, flood protection, and population characteristics, future population growth in the Rock Island District, projected population growth and flood hazard in the Rock Island District, and average annual flood damage projections. GRA

N76-22816# Texas A&M Univ., College Station. Water Resources Inst.

ECONOMIC EFFECTS OF LAND SUBSIDENCE DUE TO EXCESSIVE GROUNDWATER WITHDRAWAL IN THE TEXAS GULF COAST AREA

Lonnie L. Jones and James Larson Sep. 1975 44 p refs

(Contracts DI-14-31-0001-5044; DI-14-34-0001-6045)

(PB-248454/1; W76-03099; OWRT-A-032-TEX(1); TR-67) Avail: NTIS HC $4.00 CSCL 13B

The Texas Gulf Coast area is experiencing subsidence of the land surface due to excessive withdrawals of ground water. Damages and property losses are significant, especially along the upper Galveston Bay area, including Houston, Baytown, Clear Lake City and other developments. The study estimates total annual damages and losses for a 945 square mile study area to be $31.7 million. Temporary flooding, permanent inundation, bulkheading and landfiling were the major subsidence-related causes of cost and/or losses in property value. Structural damages from subsidence aggrevated faults were also significant. The importation of up to 198 billion gallons per year of water is proposed in order to avoid subsidence. GRA

N76-22817# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center for Solar-Terrestrial Physics.

HIGH LATITUDE SUPPLEMENT TO THE URSI HANDBOOK ON IONOGRAM

W. R. Piggott Oct. 1975 279 p Prepared in cooperation with Appleton Lab., Slough (England)

(PB-247916-50; UAG-50; NOAA-75112404) Avail: NTIS MF $2.25; HC available from National Climatic Center, Attn: Publications. Federal Bldg., Asheville, N. C. 28801. Subscription $25.00/year. $4.00 this issue CSCL 04A

This is a supplement to the URSI Handbook of Ionogram Interpretation and Reduction and provides samples of actual

ionograms to illustrate the line drawings given in the handbook, and reference ionograms and ionograms sequences so as to aid future discussion and to clarify particular difficulties. This collection should be useful to scientists who need to use ionospheric data but are not expert in the field of ionogram interpretation. GRA

N76-22818# Alaska Univ., College. Inst. of Water Resources.

WINTER SOIL WATER DYNAMICS

D. L. Kane Dec. 1975 15 p refs

(Contract DI-14-31-0001-5002)

(PB-248458/2; IWR-70; W76-03002; OWRT-A-053-ALAS(2)) Avail: NTIS HC $3.50 CSCL 02F

Field data on soil thermal moisture regimes over a winter season are studied with emphasis on the measurement of soil pore pressures and changes in the soil moisture content. Soil tension measurements in advance of the freezing front were made on two sites, one a burned site and the other an unburned natural site. Two techniques were used to measure soil tensions: one contained an antifreeze solution in the porous cup tensiometer, while the other contained water. A very rapid rise in pore pressures occurred immediately after the onset of freeze-up. Later, the difference in pore pressures at depth was such that the hydraulic gradient reversed direction. Under these conditions, soil moisture moves toward the ground surface with such movement resulting in moisture depletion during the winter. Water, as well as the soil condition during the spring break-up, is vital to an understanding of the many engineering and hydrologic problems that develop in cold regions. GRA

N76-22819# Alaska Univ., College. Inst. of Water Resources.

HEAT AND MASS TRANSFER IN COLD REGIONS SOILS

Douglas L. Kane, James N. Luthin, and George S. Taylor Jun. 1975 57 p refs

(Contract DI-14-31-0001-5002)

(PB-248457/4; IWR-65; W76-03001; OWRT-A-053-ALAS(1)) Avail: NTIS HC $4.50 CSCL 02F

Many parts of interior Alaska have a fire-dominated environment. It has been recognized that there are many beneficial effects of fire; consequently, the past fire control philosophy has been altered. Prescribed and controlled burning are being considered under the new approach. The more intense burns occur in the black spruce (Picea-Mariana)forests which are characterized by a thick organic layer and a shallow mineral soil underlain by permafrost. From field data, it is clear that both the thermal and moisture regimes undergo considerable alteration due to fire. GRA

N76-22820# Alaska Univ., College. Geophysical Inst.

STRUCTURE AND PROPERTIES OF ICE LENSES IN FROZEN GROUND

T. E. Osterkamp Feb. 1975 35 p refs

(Contract NOAA-40-3-158-41; Proj. C-4049)

(PB-248708/0; UAG-R-233; Sea-Grant-75-1; W76-03140; OWRT-C-4049(9010)(1)) Avail: NTIS HC $4.00 CSCL 08L

A diamond wire saw was modified for cutting thin sections of frozen soil and suitable operating conditions were determined experimentally. A lubricated wire, 0.34 mm in diameter, operated at cutting speeds less than 30 cm/sec and cutting forces less than 100 g produced smooth cut surfaces on thin sections 0.4-0.5 mm in thickness. The temperature and wire size were not critical operating parameters and the wire tensions recommended by the manufacturer were satisfactory. A technique for mounting, photographing, and storing the thin sections was described. More than 50 thin sections were cut from several frozen ground cores. Ice lenses in a well-drained silt were few in number and formed as filaments of small platelets. Author

N76-22821# Geological Survey, Menlo Park, Calif.

STRESS ANALYSIS OF AN INTERNALLY BALANCED FORCE SYSTEM Final Report

Albert T. F. Chen May 1975 71 p

(PB-248030/9; USGS-GD-75-022) Avail: NTIS HC $4.50 CSCL 08G

A two-dimensional, analytical model was formulated for a dual-phase, particulate composite which approximates the internal structures of certain rock types. The finite element method was used to analyze the elastic response of this model to various static loading conditions. The state of internally balanced forces was achieved through prestressing one material of the composite only and subsequently releasing the load after the other material of the composite was introduced. Distributions of residual stresses resulted from these internally balanced forces were found to depend primarily on the Poisson's ratio of the prestressed material. The displacement field resulting from coring is believed to cause possible complications in making interpretations of surface stress measurements. A computer program used in the analysis is included. GRA

N76-22822# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

GEOPHYSICAL METHODS IN TERRESTRIAL MATERIAL PROPERTY DETERMINATIONS Air Force Surveys in Geophysics

Emmanuel E. Bliamptis and Ker C. Thomson 23 Jul. 1975 38 p refs

(AF Proj. 7639; DNA Proj. NWET-Y99QAXSB101)

(AD-A018334; AFCRL-TR-75-0393; AFCRL-AFSG-315) Avail: NTIS CSCL 08/7

In-house and contractual research was conducted on the relationships between mechanical (strength) properties of rock and soil material and their electrical properties. A theoretical study involved the quantum electromagnetic and elastic interactions of crystals and solids. Laboratory and field investigations were made of the porosity and surface crack networks of large masses of quarry rocks, which govern their conductivity and permittivity. Thermal and mechanical stressing of rocks were analyzed. Electrical parameters of deep mine rocks were measured in-situ with emphasis on frequency/conductivity relationships. Direct mapping of rock strength as a function of electrical resistivity was investigated in the field. A three-dimensional modeling program was conducted in the laboratory. Field measurements of dynamic electrical conductivity of various earth materials were made under conditions of a rapid stress generated by high explosive setonations. Correlations demonstrated by this geophysical and geological research can be useful in prediction or evaluation of nuclear weapon shock effects on military installations. GRA

N76-22823# Lamont-Doherty Geological Observatory, Palisades, N.Y.

SEISMICITY IN NEW YORK STATE, JANUARY 1974 TO JUNE 1975. STUDY OF EARTHQUAKE HAZARDS IN NEW YORK STATE AND ADJACENT AREAS Annual Technical Report, 1 Jul. 1974 - 30 Jun. 1975

Lynn R. Sykes, Marc L. Sbar, and David W. Simpson 4 Aug. 1975 124 p refs Sponsored by New York State Energy Res. and Develop. Authority

(PB-248531/6; NYSERDA-75/13) Avail: NTIS HC $5.50 CSCL 08K

A network of stations was established to examine the seismicity of New York State. Seismic zones have been postulated to occur in New York along the St. Lawrence River and southwest into Arkansas, and a northwest trending Boston-Ottawa Zone. Data recorded from January 1974 to June 1975 do not support the presence of a continuous seismic trend along the St. Lawrence River and into western New York. The zone appears to be a series of localized sites. The Boston-Ottawa Seismic Zone appears to project in a northwesterly direction from Boston with a possible gap in Vermont. Most of the earthquakes in New York appear to be part of this latter zone. GRA

N76-22824# Lamont-Doherty Geological Observatory, Palisades, N.Y.

IN-SITU STRESS MEASUREMENT PROGRAM-FIELD RESULTS. DETERMINATION OF THE REGIONAL STRESS FIELD IN NEW YORK STATE AND ADJACENT AREAS BY IN-SITU STRAIN RELIEF MEASUREMENTS Technical Report, 1 Feb. - 31 Aug. 1975

Marc L. Sbar, Terry Engelder, and Warren Prell 1975 62 p refs Sponsored by New York State Energy Res. and Develop. Authority

(PB-248538/1; NYSERDA-75/10) Avail: NTIS HC $4.50 CSCL 08K

The mapping of stress orientations and magnitudes in rock

outcrops to identify domains of uniform stress were studied. These uniform stress domains help to redefine uniform stress field domains in rock outcrops of tectonic provinces, and are applicable to the problems of earthquake hazard analysis. An overcoring technique to obtain and evaluate the significance of strain-relief measurements over a relatively large region of New York was used. The technique used, the sites occupied, the rationale for their selection and some preliminary observations are discussed. GRA

N76-22825# Southwest Research Inst., San Antonio, Tex.
EVALUATION OF HIGH-RESOLUTION EARTH RESISTIVITY MEASUREMENT TECHNIQUES FOR DETECTING SUBSURFACE CAVITIES IN A GRANITE ENVIRONMENT Final Report, 12 May - 15 Dec. 1975
Lewis S. Fountain 15 Dec. 1975 78 p refs
(Contract DAAG53-75-C-0213; ARPA Order 3028; SwRI Proj. 14-4250)
(AD-A018281) Avail: NTIS CSCL 08/7

The purpose of this work was to experimentally explore the use of earth resistivity measurements using a pole-dipole electrode array in the detection of deep tunnels in a granite environment. Measurements both on the ground surface and in drilled holes were evaluated. Tests were conducted at two sites existing mine adits or tunnels, one at the Colorado School of Mines Experimental Mine site and one at a Gold Hill, Colorado, site. The mine adits with an approximate 10 x 10-foot (3 x 3-m) cross section were successfully detected from the surface at both locations through overburden thicknesses ranging from 30 to 81 feet (9.1 to 24.7 m). Other geological features of the terrain were also identified by the measurements. Successful detection was also made from a dry borehole that was 16 feet (4.9 m) horizontally displaced from the adit at the adit level. Although near surface geological features produce strong resistivity anomalies, they can be identified. GRA

N76-22826# Southwest Research Inst., San Antonio, Tex.
STRENGTH OF ICE UNDER MULTIAXIAL LOADING Final Report, 8 Sep. 1974 - 31 Aug. 1975
James Lankford and Philip H. Francis 31 Aug. 1975 15 p refs
(Contract DAHC04-75-C-0002; SwRI Proj. 02-4071)
(AD-A018373; ARO-12671.1-GS) Avail: NTIS CSCL 08/12

Strength tests were carried out using hollow, cylindrical specimens of polycrystalline ice, subject to combined axial compression, internal/external pressure. A portion of the failure envelope in principal stress space was mapped out and compared with data of other workers. The results of all available multiaxial tests can fit by a modified Paul first order criterion. GRA

N76-23085* Smithsonian Astrophysical Observatory, Cambridge, Mass.
DOPPLER TRACKING EXPERIMENT MA-089
G. C. Weiffenbach and M. D. Grossi *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 31 p refs (For availability see N76-23074 13-88)
CSCL 08E

N76-23086* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEODYNAMICS EXPERIMENT MA-128
F. O. Vonbun, W. D. Kahn, J. W. Bryan, P. E. Schmid, W. T. Wells (Washington Analytical Services Center, Inc.), and T. D. Conrad (Washington Analytical Services Center, Jnc.) *In its* Apollo-Soyuz Test Project Feb. 1976 16 p refs (For availability see N76-23074 13-88)
CSCL 08E

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N76-22827*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
GRAVITY SHEAR WAVES ATOP THE CIRRUS LAYER OF INTENSE CONVECTIVE STORMS
James G. Stobie Dec. 1975 128 p refs Sponsored in part by AF
(Grant NsG-1023)
(NASA-CR-147140; CSU-ATSP-246; US-ISSN-0067-0340)
Avail: NTIS HC $6.00 CSCL 04B

Recent visual satellite photographs of certain intense convective storms have revealed concentric wave patterns. A model for the generation and growth of these waves is proposed. The proposed initial generating mechanism is similar to the effect noticed when a pebble is dropped into a calm pond. The penetration of the tropopause by overshooting convection is analogous to the pebble's penetration of the water's surface. The model for wave growth involves instability due to the wind shear resulting from the cirrus outflow. This model is based on an equation for the waves' phase speed which is similar to the Helmholtz equation. It, however, does not assume an incompressible atmosphere, but rather assumes density is a logarithmic function of height. Finally, the model is evaluated on the two mid-latitude and three tropical cases. The data indicate that shearing instability may be a significant factor in the appearance of these waves. Author

N76-22828*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
AIRCRAFT MEASUREMENTS AND ANALYSIS OF SEVERE STORMS: 1975 FIELD EXPERIMENT Final Report, 7 Feb. 1975 - 31 Jan. 1976
Peter C. Sinclair Mar. 1976 94 p refs
(Grant NsG-1023)
(NASA-CR-146560) Avail: NTIS HC $5.00 CSCL 04B

Three aircraft and instrumentation systems were acquired in support of the severe storm surveillance program. The data results indicate that the original concept of a highly mobile research aircraft capability for obtaining detailed measurements of wind, temperature, dew point, etc., near and within specifically designated severe storms is entirely feasible and has been demonstrated for the first time by this program. This program is unique in that it is designed to be highly mobile in order to move to and/or with the developing storm systems to obtain the necessary measurements. Previous programs have all been fixed to a particular location and therefore have had to wait for the storms to come within their network. The present research is designed around a highly mobile aircraft measurements group in order to maximize the storm cases during the field measurements program. Author

N76-22829# National Environmental Satellite Service, Washington, D.C.
SATELLITE ACTIVITIES OF NOAA, 1975
Apr. 1976 19 p
(NOAA-S/T-76-2185) Avail: NTIS HC $3.50

The National Oceanic and Atmospheric Administration (NOAA) was established within the United States Department of Commerce in 1970 to improve man's understanding and increase his uses of the air and water environment. The NOAA carries out these responsibilities by maintaining an operational satellite system; by continuing programs for monitoring and predicting marine resources; by monitoring our marine environment continuously with improved sensors on ships, aircraft, and satellites; by improving our weather observations and forecasts through the use of automated observation stations, improved radar systems, and continued atmospheric research programs; by conducting research in weather modification; and by improving data collection, processing, and dissemination techniques. Six major components of NOAA contribute directly to the aeronautics and space program. These are the National Environmental Satellite Service, the National Ocean Survey, the National Marine Fisheries Service, the National Weather Service, the Environmental Research Laboratories, and the Environmental Data Service. Author

N76-22830*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STOCHASTIC SIMULATION OF VERTICALLY NONHOMOGENEOUS GUSTS
George H. Fichtl (Tenn. Univ. Space Inst.) and Morris Perlmutter

Sep. 1975 34 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Aug. 1976
(NASA-TM-X-73004) Avail: NTIS HC $4.00 CSCL 04B

The small-scale horizontal gust structure of detailed wind profiles along the vertical in the first 20 km of the atmosphere is a vertically nonhomogeneous process. A linear stochastic model was developed based on the process covariance function. This model was formulated through the use of a scaling hypothesis which transforms the nonhomogeneous gust process into a nondimensional gust process which is homogeneous in a nondimensional gust height coordinate. The velocity scaling parameter for the gust process is the gust standard deviation, and the length scale used to nondimensionalize the altitude is the vertical space lag associated with the first zero of the gust covariance function. State space theory was used to derive a digital filter from the model, which can be readily used to simulate gusts for space vehicle design applications. Author

N76-22831# Sandia Labs., Albuquerque, N.Mex.
WIND CLIMATOLOGY
J. W. Reed 1975 8 p refs Presented at 2d Wind Energy Conversion System Workshop, Washington, D. C., 9 Jun. 1975 Sponsored by ERDA
(SAND-75-5531; Conf-750615-1) Avail: NTIS HC $4.00

National assessments were made to find suitable test and evaluation locations. Detailed analyses have begun of specific station records to derive parametric relationships needed for turbine design. Characteristics of long wind-speed time-series will determine selection criteria for cut-in, cut-off, and rated speed, as well as storage system dimensions. Author (ERA)

N76-22832# World Meteorological Organization, Geneva (Switzerland).
BASIC SYNOPTIC NETWORKS OF OBSERVING STATIONS
1975 507 p In ENGLISH and FRENCH
(WMO-217) Avail: NTIS HC $12.75; WMO, Geneva Sw.Fr. 60

The level of implementation of basic synoptic networks in Africa, Asia, South America, North and Central America, South West Pacific, Europe and Antarctica is summarized. The stations and observational programs comprising basic synoptic network in each region are given and the state of implementation and plans for elimination of deficiencies for each individual country are noted. Network maps of surface and radiosonde/radiowind observation are included. ESA

N76-22833# Royal Netherlands Meteorological Inst., De Bilt.
SOME INVESTIGATIONS RELATIVE TO THE MONTHLY WEATHER FORECAST [ENKELE ONDERZOEKINGEN MET BETREKKING TOT DE MAANDVERWACHTING]
J. P. deJongh and S. Kruizinga 1975 12 p In DUTCH
(KNMI-V-266) Avail: NTIS HC $3.50

Two methods of forecasting making use of the linear regression technique and statistical data for the 500 and 700 mbar were investigated. They are the Perfect Prog method and the Model Output Statistics method. As a result of experiments described, it is found that the forecasts for the average 700 mbar level are of too bad a quality to enable forecasts to be made using regression for the average temperature. Forecasts at the 500 mbar level are suggested as more reliable and should be considered instead. Additional experiments indicate that a reasonable forecast of the average temperature can be obtained from the level pattern of the previous month. ESA

N76-22834# Royal Netherlands Meteorological Inst., De Bilt.
SELECTION OF ANALOGS USING COMPUTER FOR SHORT-TERM WEATHER FORECASTING [ANALOGENSELECTIE mbv DE COMPUTER VOOR DE MEERDAAGSE VERWACHTING]
J. P. deJongh 1975 27 p In DUTCH
(KNMI-V-267) Avail: NTIS HC $4.00

The method of short-term (72 hours) weather forecasting based on the selection of analogous 500 mbar flow patterns is described. A number of 500 mbar charts were selected from a file of about 750 charts covering the period from 1949 to present, which gives an analogy with the American meteorologists' 72 hr forecast. The selection procedure was computerized in order to save time, and also to enable the direct computer output of types of weather associated with the 500 mbar flow patterns. Analog selection methods are compared and evaluated, and translation into weather type using analogs is discussed. ESA

N76-22835# Royal Netherlands Meteorological Inst., De Bilt.
STATISTICAL CONSIDERATION OF SOME ASPECTS OF TEMPERATURE SERIES RELATED TO POSSIBLE CLIMATE VARIATIONS OR CHANGES [STATISTISCHE BESCHWOUWINGEN VAN ENKELE ASPECTEN VAN TEMPERATUURREEKSEN IN VERBAND MET MOGELIJKE KLIMAATSCHOMMELINGEN OF VERANDERINGEN]
P. J. Rijkoort 1975 19 p refs In DUTCH
(KNMI-V-268) Avail: NTIS HC $3.50

Various long term temperature series have been considered statistically from the point of view of possible climatic changes on the Northern Hemisphere. Results are not conclusive, and a more systematic approach is suggested. ESA

N76-22836# Royal Netherlands Meteorological Inst., De Bilt.
SOME PRACTICAL DATA ON THE GUMBEL DISTRIBUTION [ENKELE PRAKTISCHE GEGEVENS VOOR DE GUMBELVERDELING]
S. Kruizinga 1975 13 p refs In DUTCH
(KNMI-V-269) Avail: NTIS HC $3.50

Theory and formulas are presented relating to the Gumbel distribution, which is one of three limit distributions used for describing the probability distribution of extreme values. The Gumbel distribution is used in practice for the description of the probability distribution of the maximum of a continuous stochastic function within a certain period. For precipitation, the variable studied can be the maximum daily sum per year. Some tools for Gumbel calculations, such as a nomogram and programs, are mentioned. ESA

N76-22837# Royal Netherlands Meteorological Inst., De Bilt.
ON THE AUTOMATIC HANDLING OF DATA OBTAINED FROM RECORDING CURRENT METERS
G. J. Prangsma 1975 133 p refs
(KNMI-WR-75-13) Avail: NTIS HC $6.00

Modifications of a software package for automatic processing of data obtained with automatically recording current meters, used in the observational programs of the department for oceanographic research are described. The modifications, necessary because of intensification of the program, restrictions in manpower and computer time, and the necessity to produce averaged data for exchange among participants to the ICES Pilot Current Meter Network, involved detection and elimination of as many errors as possible, computation of the data products agreed upon for exchange under ICES, and computer time equal to or less than the existing package. Buffering techniques, error detection, interpolation procedures, and data products computed (tidal mean values for speed components and temperature) are discussed. ESA

N76-22838# Royal Netherlands Meteorological Inst., De Bilt.
SYNOPTIC AND UPPER AIR OBSERVATIONS IN THE NETHERLANDS, VOLUME 19, 1974
1975 395 p In ENGLISH and DUTCH
(KNMI-142-19) Avail: NTIS HC $10.75; Roy. Neth. Meteorol. Inst. DFl. 20

Observations made and recorded during 1974 at meteorological stations in the Netherlands, on-board light vessels and from an automatic weather station on a platform in the North Sea are given. Daily observations and summaries of monthly and yearly pressure, temperature, relative humidity, and wind data are tabulated. ESA

N76-22839# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERICAL POLLUTION. PRECIPITATION MEASUREMENTS USING STORAGE GAGES. NETWORK OF THE INSTITUT NATIONAL DES INDUSTRIES EXTRACTIVES Annual Report, 1973 [POLLUTION ATMOSPHERIQUE 1973. MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT. RESEAU DE L'INSTITUT NATIONAL DES INDUSTRIES EXTRACTIVES (INIEX)]
1975 46 p In FRENCH and DUTCH Prepared jointly with

Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $4.00

Results for 1973 of the first Belgian permanent control network of sedimental dust are given and pollution distribution maps shown. ESA

N76-22840# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
GROUND-BASED MULTISPECTRAL PASSIVE MICROWAVE SOUNDING OF ATMOSPHERIC TEMPERATURE PROFILES NEAR 60 GHz
Friedrich Malota and Volker Stein 5 Dec. 1975 57 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-01) Avail: NTIS HC $4.50; DFVLR, Cologne, DM 22.80

The relation between atmospheric parameters and thermal microwave radiation, expressed by noise temperature, was derived for ground-based measurements. The influence of various atmospheric situations (cold, middle attitude, hot atmosphere), cloud formations as well as temperature inversion layers near earth surface, upon the noise temperatures was investigated. Some computational results are presented for the reconstruction problem of vertical temperature profiles from measured values of the noise temperature. Author (ESA)

N76-22841# Royal Netherlands Meteorological Inst., De Bilt.
SPATIAL INTERPOLATION OF DAILY RAINFALL TOTALS. AN EXPERIMENTAL TREATMENT
S. Kruizinga and G. J. Yperlaan 1976 94 p refs In DUTCH; ENGLISH summary
(KNMI-WR-76-4) Avail: NTIS HC $5.00

Several weighted averages of surrounding stations' interpolation techniques for the estimation of the daily total amount of rainfall in the Netherlands were evaluated. Some general rainfall statistics, 12 years of daily rainfall measurements at 35 sites, are given. The results of the following interpolation methods are presented: nearest neighbor estimation; weighted mean of surrounding stations with chosen weights; optimal estimation with 7 surrounding stations; interpolation by fitting functions. It is concluded that a weighted average of a small number of surrounding stations gives satisfactory results and that the density of the station network does not have a major influence on the interpolation error. ESA

N76-22842# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
IMPACTS OF CLIMATIC CHANGE ON THE BIOSPHERE. CIAP MONOGRAPH 5. PART 1: ULTRAVIOLET RADIATION EFFECTS (CHAPTERS 1 THROUGH 3) Final Report
Sep. 1975 632 p refs
(Contract DOT-OS-30057)
(PB-247724/8; DOT-TST-75-55-Pt-1-CH-1-3; Mono-5) Avail: NTIS HC $16.25 CSCL 06F

Contents: expected changes in solar UV radiation; Impacts of elevated UV-B radiation intensities on the biosphere; potential depletion of the ozone column from stratospheric flight; expected changes in the middle UV and biologically effective doses; penetration of solar ultraviolet radiation into terrestrial plant communities; penetration of ultraviolet radiation into natural waters; general UV-radiation physics and photobiological principles; effects of UV radiation on nucleic acids; genetic and chromosomal effects of UV radiation; linking photobiological studies at 254 NM with UV-B. GRA

N76-22843# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
IMPACTS OF CLIMATIC CHANGE ON THE BIOSPHERE. CIAP MONOGRAPH 5. PART 1: ULTRAVIOLET RADIATION EFFECTS (CHAPTERS 4 THROUGH 10) Final Report
Sep. 1975 704 p refs
(Contract DOT-OS-30057)
(PB-247725/5; DOT/TST-75-55-Pt-1-CH-4-10; Mono-5) Avail: NTIS HC $18.75 CSCL 06R

Contents: plant responses to UV radiation; responses to UV radiation by bacteria, algae, protozoa, aquatic invertebrates, and insects; nonhuman vertebrate responses to UV radiation; biomedical implications of UV changes for man; predicting evolutionary response of natural populations to increased UV radiation; error and sensitivity analysis of estimated biological responses to ultraviolet perturbation; monitoring for effects of stratospheric aviation biospheric impact and assessment (mesa III). GRA

N76-22844# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
IMPACTS OF CLIMATIC CHANGE ON THE BIOSPHERE. CIAP MONOGRAPH 5. PART 2: CLIMATIC EFFECTS Final Report
Sep. 1975 529 p refs
(Contract DOT-OS-30057)
(PB-247726/3; DOT/TST-75-55-Mono-5-Pt-2) Avail: NTIS HC $13.00 CSCL 06R

Contents: perturbation of the earth's climate from stratospheric flight; modeling plant atmosphere systems; agricultural implications of climatic change; natural ecosystem response to climatic change; potential effects of disease impact on forest ecosystems; and monitoring for the effects of stratospheric aviation - biological impacts and assessments (mesa III). GRA

N76-22845# National Weather Service, Silver Spring, Md. Office of Hydrology.
STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, NORTH OF CAPE LOOKOUT
Francis P. Ho and Robert J. Tracey Nov. 1975 54 p refs
(PB-247900/4; NOAA-TM-NMS-HYDRO-27; NOAA-75112007) Avail: NTIS HC $4.50 CSCL 08C

Storm tide height frequency distributions are developed on the coast of North Carolina, north of Cape Lookout, for the National Flood Insurance Program. Storm tides are computed from a full set of climatologically representative hurricanes using the National Weather Service numerical dynamic storm surge model. Winter storm effects are estimated from tide gage records. Storm tide levels from all storms are shown in coastal profile between annual frequencies of 0.10 and .002. The report is intended for use in estimating actuarial risk to buildings from coastal floods and in land use management. GRA

N76-22846# National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
TORNADO OUTBREAK OF APRIL 3-4, 1974, SYNOPTIC ANALYSIS
Lee R. Hoxit and Charles F. Chappell Oct. 1975 54 p refs
(PB-247361/9; NOAA-TR-ERL-338; NOAA-75111302) Avail: NTIS HC $4.50 CSCL 04B

Synoptic scale analyses of the intense spring cyclone that produced the widespread tornado outbreak on April 3-4, 1974, are presented for the period from 1200 GMT April 2 to 1200 GMT April 4. The tracks of 148 tornadoes were recorded in the 24-hour period from noon CST April 3 to noon CST April 4. The combined path length of these storms was 2,598 miles. Additional tornadoes occurred the night of April 2 and the afternoon of April 4. Numerous wind and hailstorms were also reported with this system. During the afternoon and evening of April 1, a strong baroclinic wave at upper levels moved onto the northern California and Oregon coasts, with the associated Pacific cold front advancing through Nevada and Idaho. This system eventually produced over the eastern U.S. the severe weather on April 3-4. The dynamics and kinematics creating the severe storm environment in the Ohio and Tennessee River Valleys on the afternoon and evening of April 3 are emphasized. GRA

N76-22847# National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.
ON THE ESTIMATION (FROM BULK DATA) OF BOUNDARY LAYER VARIABLES AND CLOUD BASE MASS FLUX IN MATURE HURRICANES
Michael S. Moss and Stanley L. Rosenthal Oct. 1975 42 p refs
(PB-247572/1; NOAA-TM-ERL-WMPO-23) Avail: NTIS HC $4.00 CSCL 04B

Using bulk data from Hurricanes Daisy (1958) and Inez (1966), the authors have applied Deardorff's (1972b) planetary boundary layer parameterization scheme to compute the surface exchange coefficients for these storms. The drag coefficients compare

reasonably well with previous budget study estimates provided one assumes that Charnock's (1955) or Cardone's (1969) relation for the roughness length is valid. Rather crude calculations of the cloud base mass flux, using the Deardorff (1972b) heat transfer coefficients, indicate that the CISK hypothesis works fairly well for the relatively modest storm (Daisy), whereas its application to the more vigorous storm (Inez)is questionable. GRA

N76-22848# National Weather Service; Silver Spring, Md. Techniques Development Lab.
A PRELIMINARY VIEW OF STORM SURGES BEFORE AND AFTER STORM MODIFICATIONS FOR ALONGSHORE-MOVING STORMS
Chester P. Jelesnianski Oct. 1975 23 p refs
(PB-247362/7; NOAA-TM-NWS-TDL-58; NOAA-75111005) Avail: NTIS HC $3.50 CSCL 04B

Numerical means are used to compute storm surges (meteorological tides) in a standard basin of constant slope, bounded by a straightline coast. All storm tracks in this study are constrained to lie parallel to the coast; the storm can lie at any distance from the coast and travel with any speed, but once set, the distance and speed are invariant with time. Two driving forces, wind stress and atmospheric pressure gradient, are used to generate surges; they are derived from an analytic wind profile. The model storm is described with two invariant parameters, storm size and difference between ambient and central pressure of the storm. GRA

N76-22849# Oklahoma Univ., Norman. Atmospheric Research Lab.
ENVIRONMENTAL ENERGY FIELDS ASSOCIATED WITH SEVERE STORMS
John A. McGinley Jul. 1975 144 p Sponsored in part by the AF
(Grants NOAA-04-4-022-18; NOAA-04-3-022-9; NSF GA-30976)
(PB-247937/6; WEAT-13) Avail: NTIS HC $6.00 CSCL 04B

Variational analysis is used as a tool in defining large scale fields of horizontal and vertical motion, temperature and moisture. These quantities are then substituted into equations of continuity for heat and kinetic energy. Residuals of the continuity equations are assumed to implicitly represent energy conversions and transport by disturbances of small scale, i.e., that not resolvable from the synoptic scale data fields. Three cases are investigated, all involving tornado producing thunderstorms. GRA

N76-22850# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
ECONOMIC AND SOCIAL MEASURES OF BIOLOGIC AND CLIMATIC CHANGE Final Report
Sep. 1975 1193 p refs
(Contract DOT-OS-30057)
(PB-247727/1; DOT/TST-75-55-Mono-6) Avail: NTIS HC $32.75 CSCL 04A

The Climatic Impact Assessment Program (CIAP) of the U.S. Department of Transportation is charged with the assessment of the impact of future aircraft fleets and other vehicles operating in, or transiting through the stratosphere. CIAP monograph 6 addresses and conceptualizes socio-economic considerations for evaluating the terrestrial impact of, and potential necessary controls for, pollutant emissions in the stratosphere. It is best viewed as an exercise that utilizes methods developed in cost-benefit analyses and concentrates its attention on the conceptualization and measurement of the environmental costs associated with stratospheric travel. GRA

N76-22851# National Bureau of Standards, Washington, D.C. Aerodynamics Section.
THE DYNAMIC RESPONSE OF HELICOID ANEMOMETERS Final Report
James M. McMichael and Philip S. Klebanoff Nov. 1975 54 p refs
(PB-246861/9; NBSIR-75-772) Avail: NTIS HC $4.50 CSCL 04B

The results of an analytical and experimental investigation of the dynamic response of a helicoid anemometer are presented. Data are presented which illustrate the dynamic behavior in a spatially uniform, fluctuating flow with varying amplitudes, frequencies, and mean velocities. An analytical model governing the dynamic response is also presented and compared with the experimental results. GRA

N76-22852# Massachusetts Univ., Amherst. Water Resources Research Center.
A LABORATORY INVESTIGATION OF THE EFFECT OF SURFACE FILMS IN WIND INDUCED REAERATION
Donald C. Knudsen and Peter A. Mangarella Aug. 1975 110 p
(Contract DI-14-31-0001-4021)
(PB-248462/4; Completion-FY-76-1; PUB-54; W76-03100; OWRT-A-056-MASS(1)) Avail: NTIS HC $5.50 CSCL 13B

The effect of surface films on wind induced atmospheric reaeration of standing water was studied in a series of laboratory experiments. Measurements were made of reaeration into a small pool of water recessed into the floor of a wind tunnel at wind speeds from 3.8 m/s to 7.2 m/s, with and without a soluble surfactant in the water. An unusual measurement technique was employed which involved the unsteady state electrolytic reduction of dissolved oxygen at a silver cathode immersed in the water, and a regression analysis of the current time data to obtain the reaeration coefficient, K sub L. GRA

N76-22853# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
DETERMINATION OF R-Z RELATIONSHIPS FOR WEATHER RADAR USING COMPUTER OPTIMIZATION TECHNIQUES, PART 2 Final Report
P. L. Smith, Jr., D. E. Cain, A. S. Dennis, and J. R. Miller, Jr. Apr. 1975 100 p refs
(Contract DI-14-06-D-6660)
(PB-248775/9; Rept-75-3-Pt-2) Avail: NTIS HC $5.00 CSCL 04B

Quantitative radar data were collected from a 10-cm radar data set in western North Dakota during the summer of 1972 in connection with a randomized pilot project of cloud seeding. The radar data were recorded on magnetic tape for subsequent computer reduction and analysis. The computed radar reflectivity factors have been compared with rain gage observations collected by a network of 22 recording rain gages to obtain a relationship between hourly rainfall accumulation and the observations of the radar reflectivity factor Z. The relationship was obtained by applying a computer optimization technique. GRA

N76-22854# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
THE POTENTIAL FOR RAINFALL INCREASES FROM CONVECTIVE CLOUDS IN THE NORTHERN PLAINS
A. S. Dennis, J. H. Hirsch, D. E. Cain, J. R. Miller, Jr., and A. Koscielski Sep. 1975 70 p refs
(Contract DI-14-06-D-6796)
(PB-248920/1; Rept-75-12) Avail: NTIS HC $4.50 CSCL 04B

Investigations using data collected during field experiments in cloud seeding over the past ten years are described. The 10-cm radar data from Project Cloud Catcher are analyzed for the first time in terms of individual cells rather than test cases as a whole. The Cloud Catcher cases of 1971-72 were randomly assigned to seed and no-seed categories with salt being the usual seeding agent. A comparison of 41 cells drawn from the seed population and 16 drawn from the no-seed population shows no difference in cloud depth but suggests significant differences in some other variables. The Rapid Project was a randomized crossover experiment with separate target areas for southwest and northwest flow days. GRA

N76-22855# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
EFFECTS OF CLOUD SEEDING ON SUMMERTIME PRECIPITATION IN NORTH DAKOTA Final Report
A. S. Dennis, J. R. Miller, Jr., E. I. Boyd, and D. E. Cain Mar. 1975 111 p refs
(Contract DI-14-06-D-6660)
(PB-248797/3; Rept-75-1) Avail: NTIS HC $5.50 CSCL 04B

A randomized pilot project was conducted from 1969 to

1972 to test effects of cloud seeding upon growing season precipitation in western North Dakota. The principal seeding method was the operation of silver iodide generators on aircraft below cloud base. Data were collected by radar, instrumented aircraft, rain gages, and passive hail indicators. The analysis provides evidence that silver iodide seeding of convective clouds leads to (1) an increase in the frequency of rainfall events at the target gages, (2) an increase in the average rainfall recorded per rainfall event, and (3) an increase in total rainfall on the target. The set of days to which this evidence applies is those days with dynamic seedability. GRA

N76-22856# Miami Univ., Coral Gables, Fla. Remote Sensing Lab.
ANALYSIS OF HURRICANE ELLEN 1973, AIRBORNE RADAR DATA Final Report
H. V. Senn 31 Aug. 1975 27 p refs
(Contract NOAA-03-5-022-39)
(PB-248608/2; NOAA-75120116) Avail: NTIS HC $4.00 CSCL 04B

A summary of work is given (including travel and activities concerned with consulting) on the proposed characteristics and operation of the new P-3 radars as well as studies of the radar data from hurricane Ellen. The reasons for poor correlation between the radar data and the simultaneously gathered foil data are explained, along with suggestions on obtaining better quantized radar data both with the present equipment and with the next generation presently coming into the field. A short review of progress on software needs and continuing work to support the data gathering efforts is included. GRA

N76-22857# Illinois State Water Survey, Urbana.
STUDIES OF SELECTED PRECIPITATION CASES FROM METROMEX Report of Investigations
Stanley A. Changnon and Richard G. Semonin 1975 335 p refs
(Grants NSF GI-38317; NSG GI-38329)
(PB-248669/4; RI-81) Avail: NTIS HC $10.00 CSCL 04B

In the analysis of METROMEX field data, nine rain periods were chosen for in-depth investigations to better define the urban-related mechanisms that cause the summer rainfall in and east of St. Louis and Wood River to be greater than that in surrounding areas. Principal findings were that the urban areas: (1) Initiated and thus increased the number of raincells; (2) intensified rain and severe weather from the urban-initiated cells by their subsequent merger; (3) intensified rain and severe weather from existing cells passing over the urban areas by the effect of their heat, moisture, and/or aerosol plumes; (4) produced these effects only when rain conducive synoptic conditions existed; and (5) operated with a domino effect. GRA

N76-22858# Aerometric Research, Inc., Goleta, Calif.
LARGE SCALE EFFECTS OF CLOUD SEEDING Final Report, 1970 - 1974
Keith J. Brown, John R. Thompson, and Robert D. Elliott Jun. 1975 213 p
(Contract DI-14-06-D-6841)
(PB-248858/3; ARI-75-2) Avail: NTIS HC $7.75 CSCL 04B

At the conclusion of a nine year study to determine the large scale effects of cloud seeding, the statistical evidence indicates that modification of precipitation patterns over a large area is a persistent feature in all of the winter orographic seeding programs studied. The most frequent location for these extra-area effects is 150-200 km from the seeding source and 20 to 40 degrees to the right of the 700 mb wind flow. The extra-area effect is always of the same sign and generally slightly larger in magnitude than the primary seeding effect. It is hypothesized that the major extra-area enhancement of pricipitation occurs during those portions of orographic storms containing organized convection. GRA

N76-22859# National Bureau of Standards, Washington, D.C.
SIMULATED PRECIPITATION REFERENCE MATERIALS Final Report
J. K. Taylor, E. R. Deardorff, R. A. Durst, E. J. Maienthal, and T. C. Rains Oct. 1975 25 p
(PB-248743/7; NBSIR-75-958) Avail: NTIS HC $3.50 CSCL 07D

The preparation of a series of reference materials for chemical analysis of natural precipitation is described. The materials consist of ampoules of concentrates which can be diluted to simulate naturally collected samples of rainwater. The analytical measurements made to verify the composition of the samples are also described. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N76-22860 California Univ., San Diego.
OBSERVATIONS OF THE POWER AND DIRECTIONAL SPECTRUM OF OCEANIC SURFACE WAVES Ph.D. Thesis
Lloyd Allen Regier 1975 193 p
Avail: Univ. Microfilms Order No. 76-7817

Five estimators of the directional spectrum are presented and their performance compared using simulated data. A priori estimators are found to perform poorly unless the actual spectral width is broader than the window of the estimator. The maximum-likelihood estimator performs well on narrow angular distributions but produces misleading estimates of broadband spectra. A new data-adaptive estimator is derived which performs well on both narrow and broad band spectra. Estimates of the power spectrum and directional spectrum of oceanic surface waves were obtained from data taken during the Barbados Oceanographic and Meteorological Experiment. Wind speeds ranged from 5 to 10 m/s throughout the month's duration of the experiment. Dissert. Abstr.

N76-22861*# National Oceanic and Atmospheric Administration, Miami, Fla.
A COMPARISON OF SYNOPTIC AND SKYLAB S193/194 DETERMINATIONS OF OCEAN SURFACE WINDSPEEDS
Duncan Ross, Principal Investigator [1975] 76 p refs EREP (NASA Order T-4644-B)
(E76-10312; NASA-CR-147540) Avail: NTIS HC $5.00 CSCL 04B

There are no author-identified significant results in this report.

N76-22862*# Research Triangle Inst., Research Triangle Park, N.C. Geosciences Dept.
SOME ASPECTS OF USER NEEDS FOR AN AIR-LAUNCHED, EXPENDABLE FREE-DRIFTING BUOY Final Report
Fred M. Vukovich Mar. 1976 26 p refs
(Contract NAS1-13637; RTI Proj. 41U-1077)
(NASA-CR-144988) Avail: NTIS HC $4.00 CSCL 08C

Research objectives were determined based on user's needs in which an airlaunched, free-drifting buoy would significantly contribute to the accomplishment of these objectives. The objectives were formulated through discussions with individuals representing federal and state agencies and universities. The most immdediate need was in continental shelf oceanography which required data to characterize circulation in a localized mesoscale region. A tentative plan for the North Carolina Outfall Study was presented. Data from air-launched, expendable free-drifting buoys would be used in this study not only to characterize the circulation off the North Carolina coast, but also to provide data by which a three-dimensional hydrodynamic model could be verified. Author

N76-22863# Battelle Pacific Northwest Labs., Richland, Wash.
OCEANIC DISTRIBUTION AND GEOCHEMISTRY OF SEVERAL TRACE ELEMENTS AT GEOSECS STATIONS
D. E. Robertson 23 May 1975 11 p Presented at the 30th Northwest Regional Meeting Am. Chem. Soc., Honolulu
(Contract AT(45-1)-1830)
(BNWL-SA-5442; Conf-750673-4) Avail: NTIS HC $4.00

The biogeochemical and physical processes operating in the oceans create substantial geographical and vertical variations in the oceanic distribution of many trace elements. These variations are brought about by diverse mechanisms and involve trace elements of a wide spectrum of physicochemical and biological

behavior. Thus, a knowledge of these trace element distributions can help characterize some of the ocean processes in which they participate. Results of some chemical analyses of Mercury are presented. Author (NSA)

N76-22864# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
DEVELOPMENT OF A SIMPLIFIED DIAGNOSTIC MODEL FOR INTERPRETATION OF OCEANOGRAPHIC DATA
J. A. Galt Jun. 1975 53 p refs
(PB-247357/7; NOAA-TR-ERL-339; PMEL-25; NOAA-75111303) Avail: NTIS HC $4.50 CSCL 08C

A steady state numerical model of ocean circulation is formulated to include geostrophic and Ekman dynamic balances as well as the effects of bathymetric variations. The model is diagnostic in that certain segments of the flow are determined from field data. In particular the baroclinic portion of the geostrophic mode is obtained from in situ density measurements and the surface wind driven layer is determined from wind stress data. The model solves for the required barotropic mode and subsequent bottom frictional layer that satisfies continuity and the assumed boundary conditions. The dependency of the model solution on input data and boundary conditions is discussed. GRA

N76-22865# National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
WATER MOVEMENT WITHIN THE APEX OF THE NEW YORK BIGHT DURING SUMMER AND FALL OF 1973
R. L. Charnell and D. A. Mayer Apr. 1975 35 p refs
(PB-247901/2; NOAA-TM-ERL-MESA-3; NOAA-75111703) Avail: NTIS HC $4.00 CSCL 08C

An investigation of the water movement within the New York bight apex was made during the summer and fall of 1973. Observations from this study produced a fairly consistent picture of a general clockwise circulation for the mean and low frequency current motions. Additionally, the effects of stratification on the vertical structure of the flow showed the difference between the summer and late fall flow regimes. There also appeared to be, for low frequencies, excellent spatial coherence between stations in the apex area and a fairly strong relation between meteorological forcing and current motions; currents tended to lag wind by up to 18 hrs. GRA

N76-22866# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TYPE 16 FLOOD INSURANCE STUDY: TSUNAMI PREDICTIONS FOR MONTEREY AND SAN FRANCISCO BAYS AND PUGET SOUND Final Report
Andrew W. Garcia and James R. Houston Nov. 1975 271 p refs
(AD-A018421; WES-TR-H-75-17) Avail: NTIS CSCL 08/3

Calculations of runup due to seismic sea waves (tsunamis) of distant origin were made for Monterey and San Francisco Bays and the greater part of Puget Sound. Those areas which are specifically included and excluded are listed. The values presented are interpreted as being equaled or exceeded on the average of once per 100 (R100) or one per 500 (R500) yr, whichever is indicated. All runup values, R100 and R500, are referenced to the mean sea level datum. The combined effects of astronomical tides and tsunamis are incorporated into the analysis as are certain local effects. The effects of wind waves superimposed on the tsunami have been neglected. The simultaneous occurrence of a storm surge and tsunami is considered highly improbable and therefore unlikely to constitute a I in 100- or 1 in 500- yr. event. GRA

N76-22867# Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
A NUMERICAL INVESTIGATION INTO THE DYNAMICS OF ESTUARINE CIRCULATION
Alan Fred Blumberg Oct. 1975 182 p refs
(Grant NSF DES-74-08463)
(PB-248435/0; Ref-75-9; NOAA-75120117; TR-91) Avail: NTIS HC $7.50 CSCL 08C

A real time numerical model is developed to describe the dynamics and kinematics of partially mixed estuaries. The governing equations are formally laterally averaged and realistic estuarine bathymetry is included. The external inputs to the model are the salinity and tidal amplitude as a function of time at the ocean boundary and the freshwater discharge at the river boundary. The model includes the continuity, salt, and momentum balance equations coupled by an equation of state. The numerical technique conserves volume, salt, and momentum in the absence of dissipative effects. Simulations show that using a constant vertical eddy viscosity and diffusivity produce unrealistic salinity distributions, but have minor effects on the surface amplitudes GRA

N76-22868# Naval Postgraduate School, Monterey, Calif.
A COMPUTER SIMULATION MODEL OF SEASONAL VARIATIONS IN OCEAN PRODUCTION FOR A REGION OF UPWELLING M.S. Thesis
Robert Thomas Pearson Sep. 1975 77 p refs
(AD-A018324) Avail: NTIS CSCL 08/1

A computer model simulating the seasonal variations, of mixed layer nutrient concentrations, phytoplankton biomass carbon, and herbivorous zooplankton biomass carbon was developed. The simulation was generated using an annual cycle of four environmental parameters: (1) incident solar radiation, (2) upwelling velocity, (3) mixed layer depth, and (4) mixed layer temperature. Simulation results were compared with nutrient and zooplankton biomass data collected on a series of seven cruises made in central Monterey Bay from February through December, 1974. Both observed and simulation zooplankton stocks were characterized by two distinct maxima. The initial peak (1.05 gC/sq m) occurred in late July and was followed by a decline in populations through the month of August. During the fall and early winter, zooplankton biomass increased rapidly to an overall maximum of 1.85 gC/sq m. Individual environmental parameters were tested to ascertain their importance in controlling simulation results. Phytoplankton stocks were influenced principally by changes in incident radiation, whereas temperature variations produced the most significant fluctuations in zooplankton biomass. GRA

N76-22869# Naval Postgraduate School, Monterey, Calif.
THE DESCRIPTIVE AND DYNAMIC OCEANOGRAPHY OF THE MESOSTRUCTURE NEAR ARCTIC ICE MARGINS M.S. Thesis
Allan Eugene Karrer Sep. 1975 91 p refs
(ZS52555001)
(AD-A018328) Avail: NTIS CSCL 08/12

Complex temperature anomalies observed near Arctic ice margins in the Chukchi Sea were found to be associated with the interaction of the warm coastal current with the ice cover and resident bottom water. These anomalies were characterized by large temperature gradients found in areas of very low density gradient. They were in the form of inversions, interleavings, and discrete parcels which varied greatly in short distances. The processes which produced mesostructure were directly linked to the presence of ice and were found to affect the entire water column. Structure was found in the vicinity of the ice margin but was observed to dissipate well inside the ice margin. A dynamic high was found which was related to the melting of ice and characteristically occurred in the melting zone of the ice margin. This dynamic high was limited to a depth of 10 meters and is believed to be a factor in the deepening of mesostructure elements and other phenomena as they pass the ice margin with the current. GRA

N76-22870# Naval Postgraduate School, Monterey, Calif.
ANALYSIS OF WAVE-INDUCED ERRORS IN TURBULENT FLUX MEASUREMENTS M.S. Thesis
Gerald Karl Nifontoff Sep. 1975 60 p refs
(AD-A018297) Avail: NTIS CSCL 08/3

Near surface measurements of turbulent temperature and velocity fluctuations in the ocean are obscured by relatively much larger ordered fluctuations due to surface gravity waves. Analysis of measured velocity signals in the near surface region indicated that the ratio of turbulent to wave-induced kinetic energy was consistently less than .01. To a first approximation, wave-induced fluctuations should not contribute to turbulent transport. However, small instrument errors due to misalignment, phase response, or directional response may cause significant wave-induced error in direct flux measurements. The effect on

turbulent flux measurements of misalignment of the velocity sensors was examined. It was found that misalignment resulted in apparent phase shifts in the measured wave-induced signals, causing erroneous contributions to the calculated flux. For alignment errors of 3.6, the error in calculated momentum and heat fluxes could have been up to 500% and 110%, respectively. Momentum flux measurements made in deep water (with respect to the length of surface waves) were found to be less sensitive to alignment errors. The errors in this case were functions of the alignment of the flowmeter axes with the predominant wave direction. GRA

N76-22871# Oregon State Univ., Corvallis. School of Oceanography.
EXPOSURE: A NEWSLETTER FOR OCEAN TECHNOLOGISTS, VOLUME 3, NUMBER 5
Roderick Mesecar Nov. 1975 14 p refs
(Contract N00014-67-A-0369-0007; NR Proj. 083-102)
(AD-A018221) Avail: NTIS CSCL 08/3

On a recent cruise aboard Oregon State University's R. V. Yaquina, Aanderaa current meters were lowered along with a Geodyne CTD to determine whether the calibration of the Aanderaa conductivity cell was pressure dependent. Two current meters, 268 and 755, were selected from a group of twenty and tested in this manner. Current meter 268 showed no evidence of any air space between the conductivity cell and its glass liner. Current meter 755 showed air space over about 60 percent of the area behind the glass liner. These current meters were selected because we expected cells with less air space to show less conductivity change under pressure, and cells with more space to change more. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N76-22872 Utah Univ., Salt Lake City.
THE TRANSIENT RESPONSE OF ENCAPSULATED ENZYMES Ph.D. Thesis
Edward Michael Trujillo 1975 345 p
Avail: Univ. Microfilms Order No. 76-8659

A mathematical model for the transient response of encapsulated enzymes was developed that delineates the effects of the outer boundary layer, the encapsulating membrane, the partition coefficient, and diffusion with reaction within the encapsulating medium. The model incorporates both first order kinetics and Michaelis-Menten kinetics for the reaction rate. Using typical microcapsule parameters it was found that (1) the partition coefficient affects the overall rate only when the rate limiting step is diffusion through the membrane, (2) the transient overall effectiveness factor rises sharply with time and approaches an asymptotic value for most situations, and (3) the first order approximation to Michaelis-Menten kinetics is not valid when the initial bulk concentration is higher than the Michaelis constant and the overall rate is reaction limited. For extremely high enzyme loafings, the steady-state hypothesis can no longer be applied, but the reaction rate can be shown to be first order in substrate concentration. Dissert. Abstr.

N76-22873*# Southwest Research Inst., San Antonio, Tex.
BIOMEDICAL APPLICATIONS ENGINEERING TASKS Final Report
Charles J. Laenger 2 Apr. 1976 7 p
(Contract NAS9-14321; SwRI Proj. 14321)
(NASA-CR-147584) Avail: NTIS HC $3.50 CSCL 06B

The engineering tasks performed in response to needs articulated by clinicians are described. Initial contacts were made with these clinician-technology requestors by the Southwest Research Institute NASA Biomedical Applications Team. The basic purpose of the program was to effectively transfer aerospace technology into functional hardware to solve real biomedical problems. Author

N76-22874*# Scientific Translation Service, Santa Barbara, Calif.
STERILIZATION TESTS WITH ETHYLENE OXIDE
I. Berger, B. Schmidt, and H. Dobberstein Washington NASA May 1976 46 p refs Transl. into ENGLISH from Zentr. Bacteriol., Parasitenk., Abt. 1. Orig. (West Germany), v. 185, 1962 p 526-553
(Contract NASw-2791)
(NASA-TT-F-17007) Avail: NTIS HC $4.00 CSCL 06M

The germicide effect of ethylene oxide was tested in the Ben Venue sterilizer and in the Sterivit device on vegetative germs, sporogenators, fungi and earth spores. Small cambric cloth pieces and dental instruments were used as germ carriers. Ethylene oxide concentrations of 1000-12000 mg/l were used. Periods of 15 minutes up to 19 hours were chosen. Temperature was between 24 and 55 C. Relative moisture in the Sterivit device fluctuated between 55 and 60%. The experiments demonstrate that ethylene oxide has a certain germicide action, but that the certainty of the success is much smaller than that of the previously used methods: hot air and steam pressure. Author

N76-22875*# Scientific Translation Service, Santa Barbara, Calif.
TESTING OF STEAM AND GAS STERILIZERS
Kurt Liebermeister Washington NASA May 1976 35 p refs Transl. into ENGLISH from Zentr. Bacteriol., Parasitenk., Abt. 1. Orig. (West Germany), v. 184, 1962 p 181-201
(Contract NASw-2791)
(NASA-TT-F-17005) Avail: NTIS HC $4.00 CSCL 06M

It is recommended that thermoelectric testing of steam sterilizers be done using an electronic null balance amplifier and a 6 color recorder, as well as a test container with a standardized material to be sterilized. Various materials show an antibacterial aftereffect on treatment with ethylene oxide. Cultural testing of samples for bacterial growth should be done to rule out any aftereffect of the ethylene oxide on growth of test organisms. Author

N76-22876*# Lockheed Electronics Co., Houston, Tex.
SYSTEM DEVELOPMENT OF THE SCREWWORM ERADICATION DATA SYSTEM (SEDS) ALGORITHM
G. Arp, F. Forsberg, L. Giddings, and D. Phinney Jan. 1976 85 p refs
(Contract NAS9-12200)
(NASA-CR-147552; LEC-7646; JSC-10965) Avail: NTIS HC $5.00 CSCL 06C

The use of remotely sensed data is reported in the eradication of the screwworm and in the study of the role of the weather in the activity and development of the screwworm fly. As a result, the Screwworm Eradication Data System (SEDS) algorithm was developed. Author

N76-22877*# Baylor Univ., Houston, Tex. Dept. of Microbiology and Immunology.
EARLY DETECTION OF DISEASE PROGRAM: EVALUATION OF THE CELLULAR IMMUNE RESPONSE Final Report, Aug. 1972 - Aug. 1974
B. S. Criswell, Vernon Knight, R. R. Martin, and J. A. Kasel Aug. 1974 194 p
(Contract NAS9-13139)
(NASA-CR-147594) Avail: NTIS HC $7.50 CSCL 06M

The early cellular responses of specific components of the leukocyte and epithelial cell populations to foreign challenges of both an infectious and noninfectious character were evaluated. Procedures for screening potential flight crews were developed, documented, and tested on a control population. Methods for preparing suitable populations of lymphocytes, polymorphonuclear leukocytes, macrophages, and epithelial cells were first established and evaluated. Epithelial cells from viral infected individuals were screened with a number of anti-viral antisera. This procedure showed the earliest indication of disease as well as providing a specific diagnosis to the physicians. Both macrophages and polymorphonuclear leukocytes were studied from normal individuals, smokers, and patients with viral infections. Newer techniques enabling better definition of lymphocyte subpopulations were then developed, namely the E and EAC rosette procedures for recognition of T (thymus-derived) and B (bone-marrow-derived) lymphocyte subpopulations. Lymphocyte and lymphocyte subpopulation response to multiple mitogens have been evaluated. Author

N76-22878*# Baylor Univ., Houston, Tex. Dept. of Microbiology and Immunology.
EARLY DETECTION OF DISEASE PROGRAM: EVALUATION OF THE CELLULAR IMMUNE RESPONSE Final Report, Aug. 1974 - Aug. 1975
B. S. Criswell, Vernon Knight, R. R. Martin, and J. A. Kasel Jan. 1975 25 p refs
(Contract NAS9-13139)
(NASA-CR-147595) Avail: NTIS HC $3.50, CSCL 06M

Surfaces of normal, cultured, and mitogen-stimulated mouse lymphoid cells were examined by scanning electron microscopy (SEM). Lymphocytes with smooth, highly villous and intermediate surfaces were observed in cell suspensions from both spleens and thymuses of normal mice and from spleens of congenitally athymic (nude) mice. Several strain-specific surface features were noted, including the spine-like appearance of microvilli on C57B1/6 lymphocytes. Although thymus cell suspensions contained somewhat more smooth cells than did spleen cell preparations, lymphocyte derivation could not be inferred from SEM examination. Studies of cells stimulated with mitogenic agents for thymus-derived lymphocytes (concanavalin A) or for bone marrow-derived lymphocytes (lipopolysaccharide) suggested that, in the mouse, development of a complex villous surface is a general concomitant of lymphocyte activation and transformation. Author

N76-22879*# Clemson Univ., S.C. College of Physical, Mathematical, and Biological Sciences.
[INCREASED CONCENTRATION OF PSEUDOMONAS AERUGINOSA AND STAPHYLOCOCCUS SP. IN SMALL ANIMALS EXPOSED TO AEROSPACE ENVIRONMENTS] Final Report, 1 Jul. 1971 - 31 Dec. 1972
Rufus K. Guthrie 12 May 1976 28 p
(Contract NAS9-10494)
(NASA-CR-147570) Avail: NTIS HC $4.00 CSCL 06C

The effects of increased concentrations of PSEUDOMONAS AERUGINOSA AND STAPHYLOCOCCUS in the total bacterial flora of small animals exposed to simulated spacecraft environments were evaluated. Tests to detect changes in infectivity, effects of antibiotic treatments, immune responses to bacterial antigens, and effectiveness of immune responses in the experimental environment were conducted. The most significant results appear to be the differences in immune responses at simulated altitudes and the production of infection in the presence of a specific antibody. Author

N76-22880# Los Alamos Scientific Lab., N.Mex.
SURVIVAL OF CULTURED MAMMALIAN CELLS IRRADIATED AT VARIOUS DEPTHS IN THE LAMPF NEGATIVE PION THERAPY BEAM
P. W. Todd, J. Dicello, G. West, C. Shonk, M. M. Kligerman, and M. R. Raju Aug. 1975 4 p refs
(Contract W-7405-eng-36)
(LA-6049-MS) Avail: NTIS HC $4.00

Cultured human kidney T-1 cells were irradiated in flasks or on coverslips at different depths in a water phantom using the Clinton P. Anderson Meson Physics Facility (LAMPF) negative pion beam. Studies of cell survival and division delay as a function of depth and recovery between doses indicate RBEs of 1.8 + 0.3 and an ability of cells to recover between two doses of stopping pions. Author (NSA)

N76-22881# Interuniversitair Reactor Instituut, Delft (Netherlands).
COPPER-METABOLISM, PARTICULARLY IN RELATION TO WILSON'S AND MENKES' DISEASES
C. J. A. vandenHamer, J. Willemse (Univ. Hosp., Utrecht), and G. deHaas (Univ. Hosp., Utrecht) 1975 21 p refs Presented at the Symp. on Nuclear Medicine, Utrecht, 24-25 Oct. 1975
(IRI-133-75-12) Avail: NTIS HC $3.50

Although the amount of Cu in the body is usually well regulated, special circumstances may lead to Cu-toxicity or Cu-deficiency. Moreover, two hereditary defects are known: in Wilson's disease Cu is insufficiently excreted; in Menkes' disease alimentary Cu is insufficiently resorbed. Results obtained with the Cu-64 loading test, which can differentiate between normal controls and patients with Wilson's and Menkes' diseases, are described. Author (ESA)

N76-22882# Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
SUBCUTANEOUS TEMPERATURES AND PHYSICAL RESPONSES OF SHEEP TORSO COOLED WITH DRY ICE
J. Duncan, S. Konz, and D. Ames Oct. 1975 42 p refs
(Grants NSF ENG-73-03676)
(PB-247366/8; Contrib-504) Avail: NTIS HC $4.00 CSCL 06S

General hypothermia and local cooling of specific exposed organs have been reported on electrocardiagram responses, renal function, blood chemistry, and metabolism, respiration and circulation. Extrapolation from general hypothermia to locally cooling the torso with dry ice pockets may not be valid. Therefore the authors measured changes in subcutaneous temperature and heat flow rate at the skin surface, recorded electrocardiograms of sheep wearing a dry ice cooling garment in a hot environment, and compared the changes with those observed in a general cold stress environment and those in a heat stress environment without a cooling garment. GRA

N76-22883# National Inst. for Community Development, Inc., Washington, D.C.
HEALTH SERVICE TECHNOLOGY BIBLIOGRAPHIC SERVICE. VOLUME 4: AN ASSESSMENT OF POTENTIAL IMPACT OF THE MINIATURE CENTRIFUGAL FAST ANALYZER UPON THE LABORATORY SERVICES FIELD Final Report, 22 Jun. 1974 - 20 Jul. 1975
Diana Stark Oresky 7 Oct. 1975 96 p
(Contract PHS-HRA-106-74-21)
(PB-247748/7; NCHSR-76/47-Vol-4) Avail: NTIS HC $5.00 HC also available from NTIS $16.00/set of 4 reports as PB-247744-SET CSCL 06L

An assessment was made of the impact to the current situation of laboratory test provisions that would be caused by the advent of a miniaturized centrifugal fast analyzer, a spectrophotometer unique in its biochemical test capabilities as related to its size and its use of microvolume samples. The device is examined in relation to commercially available analytical instruments, biochemical test needs of health care providers, and current capability for meeting those needs. GRA

N76-23089* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ZONE-FORMING FUNGI EXPERIMENT MA-147
T. D. Rogers (Northrop Services, Inc., Houston, Tex.), G. R. Taylor, and M. E. Brower (Northrop Services, Inc., Houston, Tex.) *In its* Apollo-Soyuz Test Project Feb. 1976 12 p ref (For availability see N76-23074 13-88)
CSCL 06M

N76-23090* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MICROBIAL EXCHANGE EXPERIMENT AR-002
G. R. Taylor, K. D. Kropp (Northrop Serv. Inc., Houston, Tex.), M. R. Henney (Northrop Serv. Inc., Houston, Tex.), S. S. Ekblad (Northrop Serv. Inc., Houston, Tex.), T. O. Groves (Northrop Serv. Inc., Houston, Tex.), T. C. Molina (Northrop Serv. Inc., Houston, Tex.), J. G. Decelle (Northrop Serv. Inc., Houston, Tex.), C. F. Carmichael (Northrop Serv. Inc., Houston, Tex.), N. J. Gehring (Northrop Serv. Inc., Houston, Tex.), and E. L. Young (Northrop Serv. Inc., Houston, Tex.) *In its* Apollo-Soyuz Test Project Feb. 1976 31 p refs (For availability see N76-23074 13-88)
CSCL 06M

N76-23093* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
KILLIFISH HATCHING AND ORIENTATION EXPERIMENT MA-161
H. W. Scheld (Baylor Univ., Houston, Tex.), J. F. Boyd (Northrop Serv. Inc., Houston, Tex.), G. A. Bozarth (Northrop Serv. Inc., Houston, Tex.), J. A. Conner (Rice Univ.), V. B. Eichler (Wichita State Univ.), P. M. Fuller (Louisville Univ.), R. B. Hoffman, J. R. Keefe (Texas A and M Univ., College Station), K. P. Kuchnow (Bryn Mawr Coll.), and J. M. Oppenheimer (Mainz Univ.) *In its* Apollo-Soyuz Test Project Feb. 1976 14 p refs (For availability see N76-23074 13-88)
CSCL 06C

N76-23094* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTROPHORESIS TECHNOLOGY EXPERIMENT MA-011
R. E. Allen, G. H. Barlow (Abbott Lab., Chicago, Ill.), M. Bier (Veterans Admin. Hospital, Tucson, Ari.), P. E. Bigazzi (State Univ. of New York, Buffalo), R. J. Knox (Oregon Univ., Portland), F. J. Micale (Lehigh Univ.), G. V. F. Seaman (Oregon Univ., Portland), J. W. Vanderhoff (Lehigh Univ.), C. J. VanOss (State Univ. of New York, Buffalo), W. J. Patterson et al *In* Apollo-Soyuz Test Project Feb. 1976 23 p refs (For availability see N76-23074 13-88)
CSCL 06F

N76-23095* Max-Planck-Institut fuer Biochemie, Martinsried bei Muenchen (West Germany).
ELECTROPHORESIS EXPERIMENT, EXPERIMENT MA-014
K. Hannig and H. Wirth *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p ref (For availability see N76-23074 13-88)
CSCL 06F

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N76-22884 Maryland Univ., College Park.
THE REGENERATIVE RESPONSE OF THE SYMPATHETIC NERVOUS SYSTEM TO HYPOBARIC HYPOXIA Ph.D. Thesis
Robert Donald Resau 1975 74 p
Avail: Univ. Microfilms Order No. 76-8431

Biochemical estimations were made of the effects of hypobaric hypoxia on 6-hydroxydopamine-induced degeneration and subsequent regeneration of cardiac sympathetic nerve terminals, and of changes in sympathoadrenal catecholamines as a result of hypoxia activation. Regeneration was assessed through estimations of the reestablishment of catecholamine stores and axonal uptake of tritiated norepinephrine. Catecholamine levels in cardiac sympathetic nerves were reduced by 75-80% by 6-hydroxydopamine and hypoxia did not accentuate or lessen the depletion. Recovery of cardiac norepinephrine and amine uptake capacity was seen three weeks after sympathectomy and was unaffected by hypoxic stress. Restoration of amine uptake capacity was more rapid than that of endogenous norepinephrine stores in cardiac tissue three weeks after sympathectomy, indicating that the uptake ability of regenerating axonal membranes was being restored at a faster rate than recovery of endogenous stores of the transmitter. Dissert. Abstr.

N76-22885*# Scientific Translation Service, Santa Barbara, Calif.
STUDY OF CIRCADIAN VARIATION OF DIFFERENT CIRCULATORY AND RESPIRATORY FUNCTIONS AT SUBMAXIMAL AND MAXIMAL ERGOMETER WORK
J. Ilmarinen, J. Rutenfranz, H. Kylian, and E. Klimt Washington NASA Apr. 1976 22 p refs Transl. into ENGLISH from Eur. J. of Appl. Physiol. (West Germany), v. 34, no. 4, 1975 p 255-267
(Contract NASw-2483)
(NASA-TT-F-16997) Avail: NTIS HC $3.50 CSCL 06S

The maximal aerobic power of six highly trained young cyclists was directly measured at intervals of 4 hrs. A Latin square design was used for the test order. The results suggest a decreased cardiopulmonary working capacity at night. However, this impairment is only of practical importance if the work will be done near the limit of endurance capacity. Besides it will suggest, that the indirect methods for assessing the cardiopulmonary capacity based on V sub 0 2 max and W170 are not useful at nighttime, because the presuppositions for these methods are limited to the time of day. Author

N76-22886*# Kanner (Leo) Associates, Redwood City, Calif.
MASSIVE TRANSFUSIONS AND THERMOREGULATION
B. Constantin Washington NASA Apr. 1976 18 p refs Transl. into ENGLISH from Anesthesie Analgesie, Reanimation (Masson), v. 32, no. 6, 1975 p 961-970
(Contract NASw-2790)
(NASA-TT-F-17008) Avail: NTIS HC $3.50 CSCL 06P

The importance of the direct mechanism of deep body cooling (as opposed to the usual modes of action of cutaneous cooling) is emphasized, and the effects of cold on metabolism, circulatory phenomena and hematologic disturbances are analyzed separately. The rectal-esophageal temperature difference takes on its full pathologic significance upon arousal from anesthesia. Warming of the blood and the use of adrenolytic agents seem to be necessary to protect the body when massive transfusions are administered. Author

N76-22887*# Tennessee Univ., Memphis.
TOXICITY OF THE PYROLYSIS PRODUCTS OF SPACECRAFT MATERIALS Annual Report, 1 Aug. 1974 - 31 Jan. 1976
W. H. Lawrence 29 Mar. 1976 79 p
(Contract NAS9-13617)
(NASA-CR-147563; AR-2) Avail: NTIS HC $5.00 CSCL 96T

Data is presented which provides guides to (1) approximate temperature necessary to initiate thermodegradation of the polymeric materials tested, (2) the relative toxicity of thermodegradation products from the various materials, (3) the relative importance of carbon monoxide as the primary cause of death (as contrasted to cyanide or other toxic gases), and (4) whether or not the hazards of the fumes are confined to the time of exposure, or whether post-exposure death is likely. Two different experimental methods were employed. Author

N76-22888*# Methodist Hospital, Houston, Tex.
AUTOMATED ELECTROENCEPHALOGRAPHY SYSTEM AND ELECTROENCEPHALOGRAPHIC COORDINATES OF SPACE MOTION SICKNESS, PART 1 Final Report
James D. Frost, Jr. 25 Mar. 1976 35 p ref
(Contract NAS9-13870)
(NASA-CR-147554) Avail: NTIS HC $4.00 CSCL 06E

A self-contained and portable device which permits clinical electroencephalography (EEG) to be conducted in remote locations by minimally trained, nontechnical personnel was developed and tested. The unit accomplishes semiautomatic acquisition of EEG data from the patient, simultaneous transmission of eight data channels to a central hospital facility over conventional telephone equipment, and automatic printing (at the remote site) of the EEG report generated at the central location. Consequently, this system enables the delivery of high-quality EEG diagnostic services in a geographically remote site with the accuracy and speed formerly possible only in certain large medical centers. Beside obvious potential clinical applications, this system serves as an initial prototype of a unit which could provide inflight EEG during future space missions. Author

N76-22889*# Harding Coll., Searcy, Ark.
PROGRAM TO STUDY OPTIMAL PROTOCOL FOR CARDIOVASCULAR AND MUSCULAR EFFICIENCY Progress Report, 1 Jul. - 31 Dec. 1975
Harry D. Olree 31 Dec. 1975 22 p refs
(Contract NAS9-14134-1S)
(NASA-CR-147556) Avail: NTIS HC $3.50 CSCL 06P

Two possible ways to minimize the effects of deconditioning in space are; To achieve a very high level of conditioning immediately prior to flight, and to provide a regimen in the capsule which will maintain a moderate degree of fitness. It was determined that running and riding a bicycle ergometer at comparable heart rates produced similar gains in physical fitness variables. It was found that subjects who exercised at a 180 heart rate made greater gains in physical fitness than did those exercising at a 140 or 160 heart rate. When the length of the workout was varied, subjects exercising sixty minutes per day made greater gains than those exercising twenty or forty minutes per day. Subjects who discontinued training slowly deconditioned, but a moderate level of fitness could be maintained by exercising at a pulse rate of 160 beats per minute for twenty minute periods three times a week. Subjects who overtrained twice daily to near exhaustion increased in fitness. Author

N76-22890*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A CERVIX-TO-RECTUM MEASURING DEVICE IN A

RADIATION APPLICATOR FOR USE IN THE TREATMENT OF CERVICAL CANCER Patent Application

David R. Fischell (Howard Univ.) and Jeffrey Mazique, inventors (to NASA) (Howard Univ.) Filed 31 Mar. 1976 12 p
(Grant NGT-09-011-051)
(NASA-Case-GSC-12081-1; US-Patent-Appl-SN-672209) Avail: NTIS HC $3.50 CSCL 06B

A cervix-to-rectum measuring device to be used in the treatment of cervical cancer is presented. It includes a handle and a probe pivotably connected to the handle for insertion in the rectum. The measuring device further includes means for coupling the handle to an intrauterine radiation applicator when the latter is positioned in the uterine cervix and the probe is inserted in the rectum to pivot the handle about the probe. A gear is provided which is adapted to pivot with the probe. A pinion pivotably connected to the handle meshes with the gear. A pointer fixed to the pinion is displaced in response to the pivoting of the handle about the probe, and this displacement can be read from a scale on the handle, providing an indication of the cervix-to-rectum distance. NASA

N76-22891*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CORNEAL SEAL DEVICE Patent Application

E. F. Baehr, inventor (to NASA) Filed 13 Apr. 1976 16 p
(NASA-Case-LEW-12258-1; US-Patent-Appl-SN-676433) Avail: NTIS HC $3.50 CSCL 06B

A corneal seal device is provided which, when placed in an incision in the eye, permits the insertion of a surgical tool or instrument through the device into the eye. The device includes a seal chamber which opens into a tube which is adapted to be sutured to the eye and serves as an entry passage for a tool. A sealable aperture in the chamber permits passage of the tool through the chamber into the tube and hence into the eye. The chamber includes inlet ports adapted to be connected to a regulated source of irrigation fluid which provides a safe interocular pressure. NASA

N76-22892*# Texas Univ., Houston. School of Public Health.

PUBLIC HEALTH APPLICATIONS OF REMOTE SENSING OF VECTOR BORNE AND PARASITIC DISEASES Final Report

[1976] 204 p
(Contract NAS9-12696)
(NASA-CR-147573) Avail: NTIS HC $7.75 CSCL 06F

Results of an investigation of the potential application of remote sensing to various fields of public health are presented. Specific topics discussed include: detection of snail habitats in connection with the epidemiology of schistosomiasis; the detection of certain Anopheles breeding sites, and location of transient human populations, both in connection with malaria eradication programs; and detection of overwintering population sites for the primary screwworm (Cochliomyia americana). Emphasis was placed on the determination of ground truth data on the biological, chemical, and physical characteristics of ground waters which would or would not support the growth of significant populations of mosquitoes. J.M.S.

N76-22893*# Telecare, Inc., Houston, Tex. System Safety Branch.

PORTABLE MEDICAL STATUS SYSTEM

Otho C. Lindsey Feb. 1976 30 p refs
(Contract NAS9-14334)
(NASA-CR-147558; JSC-10753) Avail: NTIS HC $4.00 CSCL 06B

The hazards inherent in the Portable Medical Status System are identified, and the measures taken to reduce them to an acceptable level are described. Identification of these hazards is a prerequisite to use of the system on humans in the earth environment. One hazard which is insufficiently controlled and which is considered a constraint to use on humans is the level of current possible in the electrodes for the EEG (electroencephalograph) circuitry. It exceeds the maximum specified. A number of procedural and design recommendations for enhancement of safety are made. Author

N76-22894*# Albany Medical Coll., N.Y. Inst. of Comparative and Human Toxicology.

STUDY OF TOXICOLOGICAL EVALUATION OF FIRE SUPPRESSANTS AND EXTINGUISHERS Final Report

31 Mar. 1975 209 p refs
(Contract NAS9-9964)
(NASA-CR-147658) Avail: NTIS HC $7.75 CSCL 06T

The application of fluorocarbons as possible candidates for fire extinguishers and/or suppressants in confined spaces (such as spacecraft, aircraft, or submarines) was investigated, with special emphasis on their safety to man since they would be inhaled on an almost continuous basis. Short-term exposure experiments, using various animal species, were devised to look at specific parameters in order to determine which of the candidate compounds were sufficiently non-toxic to warrant long-term investigations. The following physiologic criteria were examined; tissue distribution, fluoride concentration, effect on mitochondria, microsomes, liposomes, and liver cell nuclei, erythrocyte fragility, clinical chemistry values, hematology, pathology, cardiac sensitization, behavioral effects. Various rodent species were used for initial investigations, with non-human primate exposures for Freon 116 which was warranted for negative results on rodents. Various types of exposure chambers were used, including closed dynamic chambers allowing for a recirculating atmosphere.Y.J.A.

N76-22895# Australian Atomic Energy Commission, Coogee.

HEALTH AND SAFETY RECORD OF THE NUCLEAR INDUSTRY

M. W. Carter, E. Carruthers, and J. C. E. Button Sep. 1975 24 p refs
(AAEC/IP-8) Avail: ERDA Depository Libraries HC $4.25

The claim of the nuclear industry to have an excellent safety record is examined in terms of health and accident records of workers in the industry. The nuclear industry is considered to include all work with ionizing radiations and radioactive materials, in education, research, medicine and industry. Comparisons are made with the published records of other industries, and a study is made of the performance of the nuclear industry in relation to its own safety criteria. Data are presented on the radiation exposure of nuclear workers in Europe, America, India and Australia, in relation to the internationally recommended limits, and there is some discussion of the risks involved in these limits. Author (NSA)

N76-22896# Oak Ridge National Lab., Tenn.

MEASUREMENT OF MAN'S EXPOSURE TO EXTERNAL RADIATION

K. Becker 1975 25 p refs Presented at the 2d Latin-Am. Conf. on Med. Phys. and Radiation Protect., Belo Horizonte, Brazil
(CONF-750738-1) Avail: NTIS HC $4.25

After outlining briefly the rationale for personnel radiation monitoring with integrating detectors, a review is presented of some developments which have taken place in personnel and environmental dosimetry during the past 3.5 years. The results of a pilot field experiment concerning the stability of film and thermoluminescent dosimeters (TLDs) in four Latin-American countries are summarized. It shows that film dosimeters should be used only with caution, and in locations with a moderate climate. A survey is being conducted on the current status and trends in personnel monitoring, involving detailed questioning of over 150 laboratories in about forty countries to obtain information on the type of service and detectors, evaluation and recordkeeping, additional applications, problem and development areas, intercomparisons, practical experiences with different systems, administrative and legal aspects, etc. Author (NSA)

N76-22897# Interuniversitair Reactor Instituut, Delft (Netherlands).

APPLICATIONS OF X-RAY FLUORESCENCE ANALYSIS IN MEDICINE

M. deBruin and P. J. M. Korthoven 1975 18 p refs Presented at the Symp. Nucl. Geneeskunde, Utrecht, 24-25 Oct. 1975
(IRI-133-75-08) Avail: NTIS HC $3.50

Present and future applications are discussed. These applications are detailed: in vivo analysis of organs or parts of organs; in vivo analysis of, for instance, blood, urine, and biopsy samples; and determination of element distributions at cellular level (micromapping). ESA

N76-22898# IIT Research Inst., Chicago, Ill.
BIOLOGICAL EFFECTS OF HIGH VOLTAGE ELECTRIC FIELDS: STATE-OF-THE-ART REVIEW AND PROGRAM PLAN Final Report
J. E. Bridges Nov. 1975 206 p refs
(IITRI Proj. E8151)
(PB-247454/2; EPRI-381-1-FR) Avail: NTIS HC $7.75 CSCL 06R

Although the great bulk of evidence suggests that there are no significant biological effects of electric fields as encountered under extra high voltage lines, further research is needed. Such research will be difficult and must be carefully done because the need is to uncovery any subtle effects, to prove a negative hypothesis, and to assure that transmission technology does indeed protect the public welfare. Priorities are identified and set for needed research in this area. The research plan identifies 23 specific projects which are presented in detail. GRA

N76-22899# IIT Research Inst., Chicago, Ill.
BIOLOGICAL EFFECTS OF HIGH VOLTAGE ELECTRIC FIELDS: BIBLIOGRAPHY AND SURVEY OF ONGOING WORK, 1975 Final Report
J. E. Bridges Nov. 1975 321 p refs
(PB-247455/9; EPRI-381-1B) Avail: NTIS HC $9.75 CSCL 06R

A bibliography and survey are presented of ongoing work concerning the biological effects of fields from power lines. Approximately 800 citations are noted, some with abstracts; and about 80 ongoing research efforts are identified. The following areas are emphasized: (1) ac power-line fields biological effects between 45-75 Hertz, (2) dc electrostatic field biological effects, and (3) ac power-line fields and radio-frequency wave influences on patients with implanted cardiac pacemakers. This material is intended to assist biologists and engineers concerning the biological effects of fields from overhead high-voltage power transmission lines and to guide in the planning and conduct of biological research. GRA

N76-22900# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
BIOENGINEERING STUDY OF BASIC PHYSICAL MEASUREMENTS RELATED TO SUSCEPTIBILITY TO CERVICAL HYPEREXTENSION-HYPERFLEXION INJURY Final Report, 15 Jan. 1972 - 15 Sep. 1973
Richard G. Synder, Don B. Chaffin, and David R. Foust Sep. 1975 323 p
(PB-247763/6; UM-HSRI-BI-75-6) Avail: NTIS HC $9.75 CSCL 06S

Basic physical characteristics of the neck which may influence a person's susceptibility to whiplash injury during rear end collisions have been defined using 180 human volunteer subjects chosen, on the basis of sex, age, and stature, to be representative of the U.S. adult population. The results were used to develop a method of predicting dynamic muscle force from isometric EMG data, and to examine injury susceptibility for various population groups using a biomechanical model. GRA

N76-22901# Hawaii Univ., Honolulu.
STUDIES ON HUMAN PERFORMANCE IN THE SEA, VOLUME 1 Sea Grant Program
Sep. 1975 350 p refs
(Grants NOAA-2-35243; NSF GH-29; NSF GH-62; NSF GH-93)
(PB-247920/2; UNIHI-SeaGrant-MR-76-01; NOAA-75111704) Avail: NTIS HC $10.00 CSCL 06S

The compilation of papers examines physiologic responses to hyperbarism which range from basic to highly applied research - and tries to answer 'what are the limits, and why.' Sections of the report deal with: (1) Physiology of water immersion and breath holding; (2) thermoregulation and exercise in water and/or hyperbaric environment; (3) bubble formation during decompression; (4) hyperbaric pharmacology and effects of helium breathing; and (5) psychosensory function. GRA

N76-22902# Bureau of Radiological Health, Rockville, Md.
A COMPARISON OF INSTRUMENT PERFORMANCE IN MEASURING X-RAY TUBE CURRENT AND mAs
C. J. Daniels and J. L. Silberberg Aug. 1975 40 p refs
(PB-246751/2; DHEW(FDA)-76-8013) Avail: NTIS HC $4.00 CSCL 06L

The Bureau of Radiological Health evaluated two commercially available, noninvasive, large-aperture current probe systems for suitability in the measurement of X-ray tube current and X-ray tube current-time product as required in the enforcement of the Federal performance standard for diagnostic X-ray equipment. The response of the two systems to typical X-ray tube current waveforms is investigated and compared to the response necessary for good accuracy over the range of expected exposure times and tube currents. GRA

N76-22903# Mitre Corp., McLean, Va.
BENEFITS AND PROBLEMS OF SEVEN EXPLORATORY TELEMEDICINE PROJECTS Interim Report, 29 Jun. 1974 - 30 Apr. 1975
John J. ONeill, Joseph T. Nocerino, and Philip Walcoff Oct. 1975 101 p refs
(Contract HRA-106-74-182)
(PB-247840/2; MTR-6787; NCHSR-76/20) Avail: NTIS HC $5.50 CSCL 06E

Benefits and problems are considered for utilizing visual communications in the provision of health care as derived from the experiences of seven telemedicine projects sponsored by the National Center for Health Services Research from 1972 - 1974. Each of the projects covered by the report has a specific chapter. Each project chapter has an identical format which includes a summary of each project, a technological description, a discussion of the training and orientation programs, and a delineation of operating and organizational procedures. GRA

N76-23087* California Univ., Berkeley. Lawrence Berkeley Lab.
QUANTITATIVE OBSERVATION OF LIGHT FLASH SENSATIONS EXPERIMENT MA-106
T. F. Budinger, C. A. Tobias, E. Schopper (Frankfurt Univ.), J. U. Schott (Frankfurt Univ.), R. H. Huesman, F. T. Upham, T. F. Wieskamp, J. M. Kucala, F. S. Goulding, D. A. Landis et al *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p refs (For availability see N76-23074 13-88)
CSCL 06P

N76-23088* Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).
BIOSTACK 3 EXPERIMENT MA-107
H. Buecker, R. Facius, D. Hildebrand, G. Horneck, G. Reitz, U. Scheidemann, M. Schaefer, C. Thomas, B. Toth, A. R. Kranz et al *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 28 p refs (For availability see N76-23074 13-88)
CSCL 06R

N76-23091* Baylor Univ., Houston, Tex.
CELLULAR IMMUNE RESPONSE EXPERIMENT MA-031
B. S. Criswell *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 7 p refs (For availability see N76-23074 13-88)
CSCL 06P

N76-23092* Baylor Univ., Houston, Tex.
THE EFFECTS OF SPACE FLIGHT ON POLYMORPHONUCLEAR LEUKOCYTE RESPONSE EXPERIMENT MA-032
R. R. Martin *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 29 p refs (For availability see N76-23074 13-88)
CSCL 06P

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N76-22904*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A MODEL FOR PREDICTION OF RIDE QUALITY IN A MULTIFACTOR ENVIRONMENT
Jack D. Leatherwood and Thomas K. Dempsey Apr. 1976 33 p refs Presented at 91st Meeting Acoustical Soc. of Am., Washington, D. C., 5-9 Apr. 1976
(NASA-TM-X-72842) Avail: NTIS HC $4.00 CSCL 05E

Recently a ride quality comfort model has been proposed which accounts for the effect of both multifrequency and multiaxes vibratory inputs, as well as nonvibratory inputs such as noise, on human comfort response. The proposed NASA ride quality model is described in general terms and selected results of several experimental investigations are presented that have contributed to the development of the model and to a more comprehensive understanding of human comfort response to vibration. Human subjective response to vertical vibration, combined vertical-lateral vibrations, and roll vibrations are discussed, and a set of vertical discomfort curves is presented. Author

N76-22905*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
THE PROBLEM OF CREW INTERRELATIONSHIPS IN INTERNATIONAL SPACE FLIGHTS
A. A. Leonov Washington NASA Apr. 1976 30 p refs Transl. into ENGLISH from Vop. Filosofii. (USSR), no. 1, 1976 p 56-69
(Contract NASw-2789)
(NASA-TT-F-17001) Avail: NTIS HC $4.00 CSCL 05E

The problem of forming international spacecrews is considered. The essential purpose of uniting the crews by a common goal, mutual trust, and friendship is discussed. Overcoming the language barrier and ideological differences are obstacles mentioned in relation to the problem of crew selection. Some observations about the Apollo-Soyuz Test Project mission are given. Author

N76-22906# Life Sciences, Inc., Hurst, Tex.
TRAINING RESEARCH PROGRAM AND PLANS: ADVANCED SIMULATION IN UNDERGRADUATE PILOT TRAINING Final Report, Jun. 1973 - Jun. 1974
W. G. Matheny Jun. 1975 103 p refs
(Contract F41609-73-C-0038; AF Proj. 1123)
(AD-A016486; AFHRL-TR-75-26-2) Avail: NTIS CSCL 05/9

In this study, a survey was made among experts in pilot training to determine the important training research problems to be undertaken in order to increase training effectiveness in beginning pilot training. The highest priority problems were examined in the light of the research equipment capabilities of the Air Force Human Resources Laboratory, Flying Training Division and administrative constraints. The initial experiments in the area of training methodology and training simulator requirements are recommended and outlined. The performance equivalence approach to research in these areas is described. Studies are suggested designed to evaluate the concept and its use in training research. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N76-22907*# Life Systems, Inc., Cleveland, Ohio.
INTEGRATION OF THE ELECTROCHEMICAL DEPOLORIZED CO2 CONCENTRATOR WITH THE BOSCH CO2 REDUCTION SUBSYSTEM Final Report
F. H. Schubert, R. A. Wynveen, and T. M. Hallick Mar. 1976 96 p refs
(Contract NAS8-30891)
(NASA-CR-144248; LSI-ER-237-10) Avail: NTIS HC $5.00 CSCL 06K

Regenerative processes for the revitalization of spacecraft atmospheres require an Oxygen Reclamation System (ORS) for the collection of carbon dioxide and water vapor and the recovery of oxygen from these metabolic products. Three life support subsystems uniquely qualified to form such an ORS are an Electrochemical CO2 Depolarized Concentrator (EDC), a CO2 Reduction Subsystem (BRS) and a Water Electrolysis Subsystem (WES). A program to develop and test the interface hardware and control concepts necessary for integrated operation of a four man capacity EDC with a four man capacity BRS was successfully completed. The control concept implemented proved successful in operating the EDC with the BRS for both constant CO2 loading as well as variable CO2 loading, based on a repetitive mission profile of the Space Station Prototype (SSP). Author

N76-22908*# Missouri Univ., Columbia. Dept. of Chemical Engineering.
MATHEMATICAL MODEL OF ONE-MAN AIR REVITALIZATION SYSTEM Final Report
Mar. 1976 208 p refs
(Contract NAS9-12526)
(NASA-CR-147580) Avail: NTIS HC $7.75 CSCL 06K

A mathematical model was developed for simulating the steady state performance in electrochemical CO2 concentrators which utilize (NMe4)2 CO3 (aq.) electrolyte. This electrolyte, which accommodates a wide range of air relative humidity, is most suitable for one-man air revitalization systems. The model is based on the solution of coupled nonlinear ordinary differential equations derived from mass transport and rate equations for the processes which take place in the cell. The boundary conditions are obtained by solving the mass and energy transport equations. A shooting method is used to solve the differential equations. Author

N76-22909*# DeBell and Richarson, Inc., Enfield, Conn.
WASH WATER WASTE PRETREATMENT SYSTEM STUDY Final Report, Mar. 1975 - Mar. 1976
Mar. 1976 59 p
(Contract NAS9-14518)
(NASA-CR-147588) Avail: NTIS HC $4.50 CSCL 06K

The use of real wash water had no adverse effect on soap removal when an Olive Leaf soap based system was used; 96 percent of the soap was removed using ferric chloride. Numerous chemical agents were evaluated as antifoams for synthetic wash water. Wash water surfactants used included Olive Leaf Soap, Ivory Soap, Neutrogena and Neutrogena Rain Bath Gel, Alipal CO-436, Aerosol 18, Miranol JEM, Palmeto, and Aerosol MA-80. For each type of soapy wash water evaluated, at least one antifoam capable of causing nonpersistent foam was identified. In general, the silicones and the heavy metal ions (i.e., ferric, aluminum, etc.) were the most effective antifoams. Required dosage was in the range of 50 to 200 ppm. Author

N76-22910*# General Dynamics/Convair, San Diego, Calif.
BOSCH CO2 REDUCTION SYSTEM DEVELOPMENT Final Report
R. F. Holmes, C. D. King, and E. E. Keller Apr. 1976 37 p refs
(Contract NAS8-27276)
(NASA-CR-144282; CASD-NAS-76-020) Avail: NTIS HC $4.00 CSCL 06K

Development of a Bosch process CO2 reduction unit was continued, and, by means of hardware modifications, the performance was substantially improved. Benefits of the hardware upgrading were demonstrated by extensive unit operation and data acquisition in the laboratory. This work was accomplished on a cold seal configuration of the Bosch unit. Author

N76-22911*# Joint Publications Research Service, Arlington, Va.
PLANTS ABOARD A SPACECRAFT
V. Yazdovskiy and G. Rusakova Washington NASA May 1976 9 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 1, Jan. 1976 p 31-32
(NASA Order W-13183)
(NASA-TT-F-16980) Avail: NTIS HC $3.50 CSCL 06K

The use of plants in spaceship life support systems is discussed, and it is concluded that the difficulties involved in the use of higher plants (as opposed to, say, algae) can be solved. Author

N76-22912*# ILC Industries, Inc., Dover, Del.
APOLLO/SKYLAB SUIT PROGRAM MANAGEMENT SYSTEMS STUDY. VOLUME 2: COST ANALYSIS

30 Apr. 1974 58 p
(Contract NAS9-6100)
(NASA-CR-147587; SES-074-101-Vol-2) Avail: NTIS HC $4.50 CSCL 06K

The business management methods employed in the performance of the Apollo-Skylab Suit Program are studied. The data accumulated over the span of the contract as well as the methods used to accumulate the data are examined. Management methods associated with the monitoring and control of resources applied towards the performance of the contract are also studied and recommended upon. The primary objective is the compilation, analysis, and presentation of historical cost performance criteria. Cost data are depicted for all phases of the Apollo-Skylab program in common, meaningful terms, whereby the data may be applicable to future suit program planning efforts. Author

N76-22913*# Food and Drug Administration, Cincinnati, Ohio.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jan. - 31 Mar. 1976
A. L. Reyes and J. E. Campbell May 1976 74 p refs
(NASA Order W-13411)
(NASA-CR-147198; QPR-44) Avail: NTIS HC $4.50 CSCL 06M

Almost 600 articles and books published since 1960 about microbial and viral inactivation are listed. This bibliography is presented to facilitate literature reviews on chemical, heat, and radiation inactivation of microorganisms and viral particles. Author

N76-22914* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOCKING MECHANISM FOR ORTHOPEDIC BRACES Patent Application
Jireh I-LeChao (Howard Univ.) and Charles H. Epps, Jr., inventors (to NASA) (Howard Univ.) Filed 14 Apr. 1976 15 p Sponsored by NASA
(NASA-Case-GSC-12082-1; US-Patent-Appl-SN-676958) Avail: NTIS HC $3.50 CSCL 06E

A locking mechanism for orthopedic braces is described which automatically prevents or permits the relative pivotable movement between a lower brace member and an upper brace member. The upper and lower brace members are provided with drilled bores within which a slidable pin is disposed, and depending upon the inclination of the brace members with respect to a vertical plane, the slidable pin will be interposed between both brace members. The secondary or auxiliary latching device includes a spring biased, manually operable lever bar arrangement which is manually unlatched and automatically latched under the influence of the spring. NASA

N76-22915# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
INFORMATION PROCESSING FOR SEVERAL SENSORY CHANNELS AND EFFECTORS, PART 1 Final Report [INFORMATIONSVERARBEITUNG BEI MEHREREN SINNESKANAELEN UND EFFEKTOREN, TEIL 1]
H. Uhlemann Nov. 1974 77 p refs In GERMAN
Avail: NTIS HC $5.00

The effect of acoustic support on a four channel visual manual compensatory control task upon control error was investigated. Tests with four channels show that no significant error reduction was obtained by acoustic support of a visual display. The improvements obtained are: facilitation of information update, especially for difficult tasks, and reduction of the frequency of necessary eye movements in the case of separated displays. The angle of separation was varied, and different control strategies were found for closely and widely spaced displays. ESA

N76-22916# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
CATALYSTS FOR A CESIUM BICARBONATE MEMBRANE CARBON DIOXIDE SCRUBBER Final Report, 1 Jul. 1973 - 30 Jun. 1974
John P. Allen Jun. 1975 67 p refs
(AF Proj. 6146)
(AD-A016471; AFFDL-TR-74-154) Avail: NTIS CSCL 07/4

Application studies of an alkaline membrane CO2 scrubber for future military self-contained aviators: oxygen systems indicated that a considerable improvement in CO2 scrubbing capacity would be needed. Alkaline membrane CO2 scrubbers had exhibited rather low operational effectiveness for CO2 control in closed-loop aviators: oxygen systems. Accordingly, catalytic alkaline materials were evaluated to determine whether CO2 permeation rates could be increased through the membranes. The materials evaluated were potassium tellurite, sodium selenite, sodium arsenite, sodium borate and 'Catacarb', a proprietary material used in acid gas scrubbing process in refineries. A special CO2 permeation apparatus was used to obtain data on permeation rates. Resulting data indicated that catalysis of varying degree occurred with some of the materials, particularly potassium tellurite. While no further efforts are planned on CO2 scrubbers for aircraft, the data is useful for future closed environment systems. GRA

N76-22917# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
A MULTIPLE CHAMBER HUMIDITY APPARATUS Final Report
Lewis Greenspan Dec. 1975 22 p Sponsored by Army Natick Development Center
(PB-247655/4; NBSIR-75-917) Avail: NTIS HC $3.50 CSCL 06M

An apparatus has been developed for studying the growth of microbiological organisms on food under controlled conditions of humidity and temperature. The apparatus contains twenty eight individual humidity chambers within a temperature controlled bath. A wide range of humidities can be provided within the individual chambers by means of saturated salt solutions. These chambers can be maintained at stable temperatures from 5 to 50C with a constancy and uniformity within plus or minus .02 C. Individual chambers may be conveniently removed or changed without affecting the other chambers. GRA

N76-22918# Southwest Research Inst., San Antonio, Tex.
IMPACT TESTING OF ALLIED CHEMICAL INFLATABAND WITH DUMMIES AND HUMAN VOLUNTEERS, VOLUME 1 Final Report, 17 Feb. - 16 May 1975
James M. Burkes, J. Robert Cromack, and Haskell Ziperman Oct. 1975 23 p refs
(Contract DOT-HS-4-00933)
(PB-246119/2; DOT-HS-801738-Vol-1) Avail: NTIS HC $3.50 CSCL 13F

The objectives of the testing program were: (1) evaluate the effectiveness and performance of the inflataband restraint system as a viable method of occupant protection in a simulated head-on automotive crash, and (2) evaluate the kinematic performance of anthropometric dummies and human volunteers under simulated impact conditions when restrained by the inflataband. The program formulated to satisfy the objectives consisted of 69 dynamic sled tests (30 dummy tests and 39 human tests). Test results indicate that (1) the inflataband provides acceptable restraint for the impact mode utilized and (2) that the dummy response to impact is more exaggerated than that observed with the human volunteers, but the discrepancies diminish with increasing impact severity. GRA

N76-22919# Southwest Research Inst., San Antonio, Tex.
IMPACT TESTING OF ALLIED CHEMICAL INFLATABAND WITH DUMMIES AND HUMAN VOLUNTEERS, VOLUME 2 Final Report, 17 Feb. - 16 May 1975
James M. Burkes, J. Robert Cromack, and Haskell Ziperman Oct. 1975 229 p refs
(Contract DOT-HS-4-00933)
(PB-246652/2; DOT-HS-801739-Vol-2) Avail: NTIS HC $8.00 CSCL 13F

Contents: Evaluation program (program plan, impact simulator, deceleration pulse, sled buck, primary restraint system, secondary restraint system, medical contingencies, instrumentation, program protocol, volunteer protocol, data reduction); operational problems; seat deterioration; dummy/human performance; restraint system performance; and medical observations. GRA

N76-22920# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A NON-CONSERVATIVE RETRIEVAL OF A TETHERED PASSIVE ASTRONAUT M.S. Thesis
Gary William Titmas Mar. 1975 72 p refs
(AD-A017182; GA/MC/74-9) Avail: NTIS CSCL 22/1

A non-conservative (angular momentum is not conserved) procedure is developed to safely retrieve a tethered passive astronaut on an extravehicular assignment (EVA). The safe retrieval of a tethered astronaut by conservative procedures has been shown to be impossible unless the conditions upon initiation of retrieval are exceptional. Safe recovery is defined as a max rotation rate of 0.5 rad/sec, a max impact velocity of 5.0 ft/sec, and a max centripetal acceleration of 8.0 ft/sec squared. This last requirement is treated by limiting the tether tension to 100.0 lfb as the astronaut's mass is taken as 13.04 slugs. To ensure the max impact velocity is not exceeded, the astronaut is reeled in at a constant rate of 5.0 ft/sec. A safe recovery is achieved by insisting that the space vehicle 'track' the astronaut during the EVA. Then, when retrieval is initiated, a force is applied through the center of mass of the space vehicle to null the angular acceleration of the astronaut with respect to the space vehicle. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N76-22921 Syracuse Univ., N.Y.
VARYING DENSITY ARRAY, A NEW DATA STRUCTURE, AND ITS APPLICATIONS TO DATA BASE Ph.D. Thesis
Gerhard Emmerich Hoernes 1974 212 p
Avail: Univ. Microfilms Order No. 76-7905

The varying density array (VDA) data structure is described with emphasis on its applicability of data bases. Examples are cited which indicate that the VDA is sufficiently general to simulate any of the data structures in the commonly used higher level languages. Dissert. Abstr.

N76-22922 Syracuse Univ., N.Y.
AN ANALYSIS OF THE PERIPHERAL STORAGE SUBSYSTEM OF A COMPUTER SYSTEM Ph.D. Thesis
Trilok Manocha 1975 234 p
Avail: Univ. Microfilms Order No. 76-7598

Peripheral storage subsystems are analyzed using a modular approach which includes performance analysis of individual devices. For fixed-head devices, four environments of queueing discipline and orientation of data records are discussed. Analyses were developed for the case of random arrivals of input/output requests with random orientation of data records and for the case of a constant queue of requests with data arranged in fixed records on the disk. For seek-type devices, two new algorithms were developed and are analyzed. Archictectural changes to the current operation of peripheral storage devices are discussed. The effects of these changes were determined by simulation. Dissert. Abstr.

N76-22923 California Univ., Los Angeles.
DATA BASE DESIGN: OBJECT DISTRIBUTION AND RESOURCE-CONSTRAINED TASK SCHEDULING Ph.D. Thesis
Mary Elizabeth Loomis 1975 241 p
Avail: Univ. Microfilms Order No. 76-8999

Design methods of data base systems, with particular emphasis on the implementation of distributed data bases in networks are described. Advances in network technology and the increasing availability of networks to the data-handling population suggest use of networks in information systems. One of the advantages of networks is the capability of parallel processing. Two major problems in design of distributed data bases are studied: (1) location of information resources among processing nodes, and (2) resource-constrained scheduling of tasks with precedence relationships. Each is formulated for analytic solution by zero-one linear programming methods. Heuristics are developed for solution of each problem. Optimal solutions are used for comparison purposes in the evaluation of the heuristic solution methods. The combinatorics, computational requirements, and complications introduced by possible degeneracy generally preclude analytic solution of realistic cases of either problem. Dissert. Abstr.

N76-22924 California Univ., Los Angeles.
A MULTIACCESS MEMORY Ph.D. Thesis
Phillip Bernard Korff 1975 211 p
Avail: Univ. Microfilms Order No. 76-8271

Techniques for the realization and implementation of a multiaccess memory are first established. Based on response time versus utilization, the performance of the memory is predicted for various types of theoretical inputs. These performance figures are justified by experimental measurements taken from the memory while functioning in a simulated multiprocessor environment. The results basically show that, when compared to a standard single access system having the same capacity, greater thioughputs and lower response times can be obtained from a multiaccess memory. If a system is to be made fault-tolerant, a multiaccess capability can again be of value. Various techniques for detecting and isolating faulty channels are explored. The degradation in memory performance due to the loss of accessing channels is also determined. Dissert. Abstr.

N76-22925 Arizona State Univ., Tempe.
HARDWARE-CONTROLLED MEMORY HIERARCHIES AND THEIR PERFORMANCE Ph.D. Thesis
William James Harding 1975 239 p
Avail: Univ. Microfilms Order No. 76-9158

The structural concepts and organization of hardware-controlled memory hierarchies are presented. Basic organizations are delineated in terms of data movement, data nesting, and store strategies. Address mapping strategies are unified into a single logical strategy, the (m,a,p) mapping strategy and some replacement algorithms are defined in terms of their allocation mapping functions. The memory level traffic intensities are defined in terms of the hierarchy structural organization. A model of hierarchy performance is developed. Basic model input is traffic intensity data developed from logical characteristics of the hierarchy. Each memory level model is developed as an embedded Markov chain and the state equations are solved. The results which the hierarchy model develops are directly related to the relative fraction of the maximum access capability of the central system accessing mechanism which the hierarchy supports. Dissert. Abstr.

N76-22926*# Intermetrics, Inc., Cambridge, Mass.
HAL/S-FC COMPILER SYSTEM SPECIFICATIONS
1 Mar. 1976 387 p refs
(Contract NAS9-13864)
(NASA-CR-147564; IR-95-5) Avail: NTIS HC $10.75 CSCL 09B

This document specifies the informational interfaces within

the HAL/S-FC compiler, and between the compiler and the external environment. This Compiler System Specification is for the HAL/S-FC compiler and its associated run time facilities which implement the full HAL/S language. The HAL/S-FC compiler is designed to operate stand-alone on any compatible IBM 360/370 computer and within the Software Development Laboratory (SDL) at NASA/JSC, Houston, Texas. Author

N76-22927*# Teledyne Controls, El Segundo, Calif.
COMMAND DECODER UNIT Final Report
8 Mar. 1976 22 p
(Contract NAS9-13565)
(NASA-CR-147571; WA-2140) Avail: NTIS HC $3.50 CSCL 09B

The design and testing of laboratory hardware (a command decoder unit) used in evaluating space shuttle instrumentation, data processing, and ground check-out operations is described. The hardware was a modification of another similar instrumentation system. A data bus coupler was designed and tested to interface the equipment to a central bus controller (computer). A serial digital data transfer mechanism was also designed. Redundant power supplies and overhead modules were provided to minimize the probability of a single component failure causing a catastrophic failure. The command decoder unit is packaged in a modular configuration to allow maximum user flexibility in configuring a system. Test procedures and special test equipment for use in testing the hardware are described. Results indicate that the unit will allow NASA to evaluate future software systems for use in space shuttles. The units were delivered to NASA and appear to be adequately performing their intended function. Engineering sketches and photographs of the command decoder unit are included. Author

N76-22928*# Brown Univ., Providence, R.I. Div. of Engineering.
SUPER HIGH COMPRESSION OF LINE DRAWING DATA
David B. Cooper Apr. 1976 47 p refs
(Grant NsG-5036)
(NASA-CR-147158) Avail: NTIS HC $4.00 CSCL 09B

Models which can be used to accurately represent the type of line drawings which occur in teleconferencing and transmission for remote classrooms and which permit considerable data compression were described. The objective was to encode these pictures in binary sequences of shortest length but such that the pictures can be reconstructed without loss of important structure. It was shown that exploitation of reasonably simple structure permits compressions in the range of 30-100 to 1. When dealing with highly stylized material such as electronic or logic circuit schematics, it is unnecessary to reproduce configurations exactly. Rather, the symbols and configurations must be understood and be reproduced, but one can use fixed font symbols for resistors, diodes, capacitors, etc. Compression of pictures of natural phenomena such as can be realized by taking a similar approach, or essentially zero error reproducibility can be achieved but at a lower level of compression. Author

N76-22929# CACI, Inc., Arlington, Va.
DEVELOPMENT OF TECHNIQUES FOR MULTIPLE DATA STREAM ANALYSIS AND SHORT-TERM FORECASTING, VOLUME 1: MULTIPLE DATA STREAM ANALYSIS Final Report, 1 Nov. 1974 - Sep. 1975
Theodore J. Rubin, James Moore, and Vivian Moore 15 Nov. 1975 91 p refs
(Contract MDA903-75-C-0129; ARPA Order 2863)
(AD-A018123; CAC123-Vol-1) Avail: NTIS CSCL 15/3

The work builds on prior research on the coding of event data and the development of quantitative indicators for defense analysis. The multiple data stream analysis based on event data coded from the daily New York Times and The Times of London from mid-1971 to mid-1974. The analysis illustrates the similarities and differences in the international interests, attention, and viewpoints of the United States and United Kingdom as reflected in these public media sources. Author (GRA)

N76-22930# CACI, Inc., Arlington, Va.
DEVELOPMENT OF TECHNIQUES FOR MULTIPLE DATA STREAM ANALYSIS AND SHORT-TERM FORECASTING, VOLUME 2 Final Report, 1 Nov. 1974 - Sep. 1975
Theodore J. Rubin, James Moore, and Vivian Moore 14 Nov. 1975 42 p
(Contract MDA903-75-C-0129; ARPA Order 2863)
(AD-A018124; CAC123-Vol-2) Avail: NTIS CSCL 15/3

The research report is principally concerned with the development of techniques for the analysis and interpretation of event data and techniques for forecasting. Techniques for two year and one month forecasting are developed and utilized in actual forecasting and are evaluated. Author (GRA)

N76-22931# California Univ., Livermore. Lawrence Livermore Lab.
DCAS: A DISTRIBUTED CAPACITY ACCESS SYSTEM
J. E. Donnelley Aug. 1975 10 p
(Contract W-7405-eng-48)
(UCID-16903) Avail: NTIS HC $4.50

The research discussed was directed toward the design and implementation of a distributed capability computing system on the ARPA network. The problem of providing intrinsic security is addressed. Author (ERA)

N76-22932# Maryland Univ., College Park. Computer Science Center.
UNIFIED THEORY OF IMAGE PROCESSING Final Report, 1 Dec. 1965 - 31 Oct. 1975
Azriel Rosenfeld 31 Oct. 1975 27 p
(Contracts N00014-75-C-0286; N00014-67-A-0239-0012; Grant NSF DCR-72-03610)
(AD-A018154) Avail: NTIS CSCL 09/2

The research conducted on this project had two main purposes: (1) Formulation of a general approach to image processing, and preparation of books and survey papers based on this approach. (2) Investigation of the formal theory of computation on pictures, involving the study of mathematical models (grammars, automata, etc.) for 'picture languages'. Over a ten year period, 39 technical reports were issued on the project; nearly all of these were later published in the form of books or journal articles. The list of these reports, and their abstracts, given on the following pages can serve as an overview of the detailed accomplishments of the project. GRA

N76-22933# Kansas State Univ., Manhattan. Dept. of Computer Science.
RESEARCH INTO THE DEVELOPMENT OF A LOW-COST HARDWARE MONITOR Final Report
V. Wallentine, G. Anderson, R. Keller, and P. Fisher Jul. 1975 272 p
(Contract DAHC04-74-G-0103)
(AD-A016951; USACSC-AT-75-07) Avail: NTIS CSCL 09/2

Progress is reported on development of the design of the hardware in the monitor, the design of the software to control the hardware, and the development of a basic reporting package useful in analyzing the data collected. The design objectives of the hardware monitor and the software interface between the monitor and the analyst were as follows: (1) to provide all the capabilities of those currently available on the commercial market, (2) to provide the measurement analyst a more flexible measurement tool with which to explore new measurements and their correlations before investing the time and effort to manually set the logic for desired measurements; (3) to develop a measurement front-end for a central processing system (minicomputer) which could be used to monitor a large range of subject systems; (4) to provide an automated method of establishing a level of correctness of the measurement data collected; and (5) to relieve the measurement analyst of detailed control of the hardware monitor and permit him to concentrate more intently on the measurement experiment. GRA

N76-22934# State Univ. of New York at Buffalo, Amherst. Statistical Science Div.
CURVE ESTIMATION AND SMOOTHING COMPUTER PACKAGE
Jean-Pierre Carmichael Jun. 1975 28 p refs
(Contract N00014-72-C-0508; NR Proj. 042-234)
(AD-A018164; TR-20) Avail: NTIS CSCL 09/2

This report describes computer subroutines for five methods of density estimation: (1) Quantile method, (2) inversion of the

Fourier transform method, (3) Kernel method, (4) Spline method, and (5) Autoregressive method. GRA

N76-22935# International Field Year for the Great Lakes Project Office, Rockville, Md.
US IFYGL SHIPBOARD DATA ACQUISITION SYSTEM Technical Manual Series
Andrew Robertson Mar. 1974 45 p Sponsored in part by Natl. Comm. for the Intern. Hydrological Decade and the Intern. Hydrological Decade
(PB-248878/1; IFYGL-TMS-5) Avail: NTIS HC $4.00 CSCL 08H

The International Field Year for the Great Lakes (IFYGL) is a joint Canadian-United States program of coordinated environmental and water resources research focused on Lake Ontario and the Ontario watershed basin. Several major data acquisition systems were developed specially for use during IFYGL. The automatic on-board data acquisition systems developed for the major U.S. research vessels used during IFYGL are described. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N76-22936 Johns Hopkins Univ., Baltimore, Md.
A SYMMETRIC, TOP-DOWN STRUCTURED APPROACH TO COMPUTER PROGRAM/PROOF DEVELOPMENT Ph.D. Thesis
Lawrence Yelowitz 1972 268 p
Avail: Univ. Microfilms Order No. 76-8504

A model is described in which a computer program and its proof of correctness are jointly developed. The model is built on a platform which makes fundamental use of the top-down structured programming, and the inductive assertion method of program proof. There are several weaknesses in the current state-of-the-art of certifying computer programs. Prominent among these is that available techniques deal only with static properties of programs. The present research shows several classes of dynamic properties that arise naturally in program development and develop apparatus within the model for stating and proving these properties. Another characteristic of current program certifications is the ad hoc approach pursued in specific cases. Our model consists of four nodes and various relations between them. The nodes are as follows: (1) problem domain; (2) program process, (3) proof processes; and (4) machine. Dissert. Abstr.

N76-22937 Wisconsin Univ., Madison.
GLOBALLY AND SUPERLINEARLY CONVERGENT ALGORITHMS FOR NONLINEAR PROGRAMMING Ph.D. Thesis
Siu Ming Chung 1975 91 p
Avail: Univ. Microfilms Order No. 75-29802

The algorithms minimize a nondifferentiable exact penalty function which has been studied by Zangwill, Pietrzykowski and Howe when the iterates are far away from the optimal solution. Gradient methods for the unconstrained minimization of differentiable functions are generalized to handle the nondifferentiable exact penalty function. The algorithm switches to a quasi-Newton algorithm near the optimal solution. Globally convergent updating schemes for the Hessian of the Lagrangian are also presented. Dissert. Abstr.

N76-22938 Texas Univ., Austin.
THE DIRECT INTERPRETATION: PROCESSORS AND LANGUAGES Ph.D. Thesis
Andrew M. Welin 1975 249 p
Avail: Univ. Microfilms Order No. 76-8124

Two results are presented: The first is a way of designing the universal hosts, i.e., computers capable of directly interpreting any machine language. The second result is a way to synthesize compact and efficient directly interpretable representations of symbolic languages. Both results are interrelated through a general model of machine languages, and in effect a model of direct interpretation. On one hand the processors proposed here are compatible with this general model, and on the other hand, the model can be applied to create directly interpretable forms closely reflecting symbolic languages. The approach to the design of the universal host is presented from the perspective of the research in microprogramming, where most work on the universal host has been done. Dissert. Abstr.

N76-22939 State Univ. of New York, Buffalo.
SUBWORDS OF DEVELOPMENTAL LANGUAGES Ph.D. Thesis
Kwok Pun Lee 1975 160 p
Avail: Univ. Microfilms Order No. 76-9077

Some properties of subwords of various types of developmental languages are examined. Three kinds of subwords are considered: arbitrary subwords, natural subwords, and prefixes and suffixes. Some formal language theoretic properties of language formed by subwords are considered. The number of subwords that can be generated by various kinds of deterministic developmental systems was specifically studied. In addition to studying subwords, new kinds of developmental systems, systems with tables and with interactions, are introduced, and some of the properties of these systems are studied. Dissert. Abstr.

N76-22940 Michigan Univ., Ann Arbor.
SOFTWARE RELIABILITY BY REDUNDANCY Ph.D. Thesis
Jack Leonard Bosworth 1975 206 p
Avail: Univ. Microfilms Order No. 76-9350

A program is redundant if it contains operations in addition to those needed to implement the basic design objectives. In order to be useful for understanding the value of redundancy in programs, an error is defined to be a sequence of states which does not occur in any correct program. The states which a program is thought to have are determined by the view which an observer has of the program and its execution. Such a view constitutes a model of the program. Most of the redundant programs considered here involve a relationship between two programs. These relationships are related to a concept of simulation between programs. An understanding of the effect of modeling and simulation concepts is essential for the design of partially self-checking, redundant programs. Dissert. Abstr.

N76-22941 California Univ., Los Angeles.
DESIGN OF A LANGUAGE FOR AN ASSOCIATIVE PROCESSOR Ph.D. Thesis
Barbard Frances Kolsky Meyers 1975 490 p
Avail: Univ. Microfilms Order No. 76-9002

Issues in the design and implementation of a programming language for an associative processor are considered. The problem is approached from two points of view, the effect of the hardware on the language, and the effect of the language implementation on features which are desirable in the hardware. First, a classification of associative processors from the software point of view is given. The language design and implementation issues which are considered are: data structuring for associative memory, binding of data structures to associative memory words, performing operations on the associative data structures, a comparison of static and dynamic scoping models for an associative memory language, mechanisms which are necessary for the management of data at run time, and language statements for the commanding of associative operations. The conclusions give recommendations to future hardware designers of associative processors for features which would aid in the language implementation. Dissert. Abstr.

N76-22942*# M&S Computing, Inc., Huntsville, Ala.
LOGSIM USER'S MANUAL
C. L. Mitchell and J. F. Taylor 13 Jan. 1972 84 p
(Contract NAS8-25621)
(NASA-CR-124210; Rept-72-0001) Avail: NTIS HC $5.00 CSCL 09B

The user's manual for the LOGSIM Program is presented. All program options are explained and a detailed definition of the format of each input card is given. LOGSIM Program operations, and the preparation of LOGSIM input data are discused along with data card formats, postprocessor data cards, and output interpretation. Author

N76-22943*# M&S Computing, Inc., Huntsville, Ala.
BANNING DESIGN AUTOMATION SOFTWARE IMPLEMENTATION Final Report

R. L. Kuehlthau 28 Oct. 1975 41 p refs
(Contract NAS8-25621)
(NASA-CR-144031; Rept-75-0037) Avail: NTIS HC $4.00 CSCL 09B

The research is reported for developing a system of computer programs to aid engineering in the design, fabrication, and testing of large scale integrated circuits, hybrid circuits, and printed circuit boards. The automatic layout programs, analysis programs, and interface programs are discussed. F.O.S.

N76-22944*# M&S Computing, Inc., Huntsville, Ala.
AIDPRF/PRFAID USER'S MANUAL
Carl H. Buck 28 Oct. 1975 28 p
(Contract NAS8-25621)
(NASA-CR-144030; Rept-75-0035) Avail: NTIS HC $4.00 CSCL 09B

The program documentation for the PRF ARTWORK/AIDS conversion program, which serves as the interface between the outputs of the PRF ARTWORK and AIDS programs, was presented. The document has a two-fold purpose, the first of which is a description of the software design including flowcharts of the design at the functional level. The second purpose is to provide the user with a detailed description of the input parameters and formats necessary to execute the program and a description of the output produced when the program is executed. Author

N76-22945*# Science Applications, Inc., Huntsville, Ala.
NASA SOFTWARE SPECIFICATION AND EVALUATION SYSTEM DESIGN, PART 1 Final Report
19 Mar. 1976 74 p refs
(Contract NAS8-31379)
(NASA-CR-144270; SAI-77-555-HU-Pt-1) Avail: NTIS HC $4.50 CSCL 09B

The research to develop methods for reducing the effort expended in software and verification is reported. The development of a formal software requirements methodology, a formal specifications language, a programming language, a language preprocessor, and code analysis tools are discussed. F.O.S.

N76-22946*# Science Applications, Inc., Huntsville, Ala.
NASA SOFTWARE SPECIFICATION AND EVALUATION SYSTEM DESIGN, PART 2 Final Report
19 Mar. 1976 211 p refs
(Contract NAS8-31379)
(NASA-CR-144271; SAI-77-555-HU-Pt-2) Avail: NTIS HC $7.75 CSCL 09B

A survey and analysis of the existing methods, tools and techniques employed in the development of software are presented along with recommendations for the construction of reliable software. Functional designs for software specification language, and the data base verifier are presented. Author

N76-22947*# M&S Computing, Inc., Huntsville, Ala.
PROGRAMMER'S MANUAL FOR THE BANNING ARTWORK PROGRAM
J. F. Taylor 5 Jun. 1970 49 p
(Contract NAS8-25621)
(NASA-CR-144247; Rept-70-0013) Avail: NTIS HC $4.00 CSCL 09B

The document is intended to serve as the programmer's Manual for the Banning Artwork Program. A detailed description of the internal logic and flow of the Artwork Program has been included in this report. It is recommended that every user review this manual in order to receive an appreciation of the functions performed by the Artwork Program; however, the User's Manual for the Artwork Program contains sufficient information to allow the designer/engineer to efficiently use the Artwork Program. Before beginning a detailed study of this Programmer's Manual, the reader should have a complete understanding of the contents of the User's Manual for the Banning Artwork Program. It is assumed that the programmer using this manual has a working knowledge of FORTRAN IV. Author

N76-22948*# State Univ. of New York, Buffalo. Dept. of Electrical Engineering.
COMPUTER PROGRAM FOR FAST KARHUNEN LOEVE TRANSFORM ALGORITHM Final Report
Anil K. Jain Feb. 1976 98 p refs
(Contract NAS8-31434)
(NASA-CR-144281) Avail: NTIS HC $5.00 CSCL 09B

The fast KL transform algorithm was applied for data compression of a set of four ERTS multispectral images and its performance was compared with other techniques previously studied on the same image data. The performance criteria used here are mean square error and signal to noise ratio. The results obtained show a superior performance of the fast KL transform coding algorithm on the data set used with respect to the above stated perfomance criteria. A summary of the results is given in Chapter I and details of comparisons and discussion on conclusions are given in Chapter IV. Author

N76-22949# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
HOPSCOTCH ALGORITHMS: A STUDY OF SOME HYBRID FINITE-DIFFERENCE TECHNIQUES
J. B. Greenberg Jan. 1976 58 p refs
(TAE-270) Avail: NTIS HC $4.50

A general family of algorithms for multidimensional linear problems is presented, and two and three-dimensional nonlinear families are also examined; the nonlinearities being assumed to have the form that arises in the Navier-Stokes equations. The potential field of applicability is evident. The results of some numerical experiments with the various techniques are described. Author

N76-22950*# Aeronutronic Ford Corp., Houston, Tex. WDL Div.
APPROACH AND LANDING TEST NETWORK INTERFACE PROCESSOR INTERFACE CONTROL DOCUMENT
1976 55 p refs
(Contract NAS9-1261)
(NASA-CR-147574; JSC-10151) Avail: NTIS HC $4.50 CSCL 09B

The design requirements are established for all external or interproject interfaces to the Network Interface Processor located in Building 30 at the Lyndon B. Johnson Space Center, Houston, Texas. In addition to external interfaces, software/hardware and special interfaces are also described. Author

N76-22951# Telecom Australia Research Labs., Melbourne.
COMPUTATION OF CHARACTERISTIC VALUES OF NON-SYMMETRIC MATRICES
L. A. Denger Feb. 1975 23 p refs
(Rept-6966) Avail: NTIS HC $3.50

An algorithm for computing the characteristic values of nonsymmetric matrices by minicomputers in BASIC language was investigated. Starting from the QR method, it was found that a simple resolving matrix can be computed, leading to more accurate results. The Main results are that Hessenberg transformations reduced to a matrix operation; the simple diagonalization process led to more accurate results; and, in some cases and indirectly, the deflation process can improve the accuracy. Author

N76-22952# Sandia Labs., Albuquerque, N.Mex.
STRUCTURED PROGRAMMING IN FORTRAN
J. A. Allensworth Sep. 1975 56 p refs
(Contract AT(29-1)-789)
(SAND-75-0423) Avail: NTIS HC $4.00

FORTRAN methods are used to aid in achieving simplicity and clarity of expression in a natural way. Schemata for applying the basic structures to FORTRAN are given. The top down method is emphasized in a pattern integrated with indentation, spacing, and comments. A technique is described for evolving the program from comments, and the program of modifying unstructured programs is discussed. This document was prepared to serve as a set of notes for a course. The examples are encoded in extended FORTRAN for the CDC-6600 computer. GRA

N76-22953# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
DDP2: AN INTERACTIVE PROGRAM FOR SOLVING NONLINEAR OPTIMAL CONTROL PROBLEMS
R. Muralidharan and Rajan Suri Oct. 1975 45 p refs
(Contract N00014-75-C-0648; Grant NSF HES-73-10323)

(AD-A017667; TR-661) Avail: NTIS CSCL 09B

DDP2 is a Program Package capable of solving nonlinear optimal control problems. It is designed to be highly interactive and capable of being used as an educational tool by graduate students in optimal control. The package incorporates a second order Differential Dynamic Programming algorithm and a first order gradient algorithm. The solution process using DDP2 is adaptive; utilizing the results of a given iteration the user may switch algorithms or inject his own intuition, based on the gradient information provided, to start the next iteration. Although designed for use on a small computer with modest facilities DDP2 promises to be a useful educational tool. Author (GRA)

N76-22954# Stanford Univ., Calif. Dept. of Computer Science.

A MICROPROGRAM CONTROL UNIT BASED ON A TREE MEMORY

Nobuki Tokura (Osaka Univ.) Aug. 1975 29 p refs

(PB-247561/4; STAN-CS-75-514) Avail: NTIS HC $4.00 CSCL 09B

A modularized control unit for microprocessors is proposed that implements ancestor tree programs. This leads to a reduction of storage required for address information. The basic architecture is extended to paged tree memory to enhance the memory space usage. The concept of an ancestor tree with shared subtrees is introduced, and the existence of an efficient algorithm to find sharable subtrees is shown. GRA

N76-22955# Federal COBOL Compiler Testing Service, Washington, D.C.

CDC 3300 CDC ANSI COBOL VERSION 3.1 CDC 3300 L MASTER RELEASE 4.0 Final Validation Summary Report

4 Dec. 1975 63 p

(AD-A018155; CCVS68-VSR120) Avail: NTIS CSCL 09/2

This Validation Summary Report (VSR) provides a consolidated summary of the results obtained from the validation of the subject compiler. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by Federal level module; a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

No abstracts in this category.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N76-22956 Texas Univ., Austin.

VISUAL PATTERN RECOGNITION USING STRUCTURE, SPATIAL RELATIONSHIPS, VISUAL CONTEXT, AND OTHER PROPERTIES Ph.D. Thesis

Michael Jack Magee 1975 162 p

Avail: Univ. Microfilms Order No. 76-8071

A computer program to recognize compound objects in straight line drawings of visual scenes was constructed. This program used both the structural characteristics of each element in the scene and its spatial relationships with other scene elements. The general context of the objects was deducted to restrict the search space. Other properties (such as the size of objects) were also used to delimit choices. A linguistic system was developed to facilitate examination and revision of the semantic data base used by the program. Dissert. Abstr.

N76-22957 California Univ., Los Angeles.

SYSTEM CHARACTERIZATION: A PATTERN RECOGNITION APPROACH Ph.D. Thesis

Thomas Matthew Simundich 1975 221 p

Avail: Univ. Microfilms Order No. 76-9014

A methodology to be employed in modelling systems governed by parabolic partial differential equations (P.D.E.) is proposed and investigated. This methodology is based upon techniques developed in the pattern recognition area and is utilized during the characterization stage of modelling. This is a critical stage in mathematical modelling wherein a mathematical expression is hypothesized in a form suitable for parameter identification. Dissert. Abstr.

N76-22958*# Brown Univ., Providence, R.I.

ON THE ROLE OF DIMENSIONALITY AND SAMPLE SIZE FOR UNSTRUCTURED AND STRUCTURED COVARIANCE MATRIX ESTIMATION

Salvatore D. Morgera (Raytheon Co., Portsmouth, R. I.) and David B. Cooper 1 Apr. 1976 40 p refs

(Grant NsG-5036)

(NASA-CR-147118) Avail: NTIS HC $4.00 CSCL 09B

The experimental observation that a surprisingly small sample size vis-a-vis dimension is needed to achieve good signal-to-interference ratio (SIR) performance with an adaptive predetection filter is explained. The adaptive filter requires estimates as obtained by a recursive stochastic algorithm of the inverse of the filter input data covariance matrix. The SIR performance with sample size is compared for the situations where the covariance matrix estimates are of unstructured (generalized) form and of structured (finite Toeplitz) form; the latter case is consistent with weak stationarity of the input data stochastic process. Author

N76-22959*# Brown Univ., Providence, R.I. Div. of Engineering.

COMPRESSION OF CONTOUR DATA THROUGH EXPLOITING CURVE-TO-CURVE DEPENDENCE

Nese Yalabik and David B. Cooper [1975] 21 p refs

(Grant NsG-5036)

(NASA-CR-147117) Avail: NTIS HC $3.50 CSCL 09B

An approach to exploiting curve-to-curve dependencies in order to achieve high data compression is presented. One of the approaches to date of along curve compression through use of cubic spline approximation is taken and extended by investigating the additional compressibility achievable through curve-to-curve structure exploitation. One of the models under investigation is reported on. Author

N76-22960# Ruhr Univ., Bochum (West Germany). Lehrstuhl fuer Mess- und Regelungstechnik.

DEVELOPMENT OF A THEORY OF SINGLE-STEP PREDICTIVE CONTROL [ENTWICKLUNG EINER THEORIE DER EINSCHRITTPRAEDIKTIVREGELUNG]

M. Sohrwardy Dec. 1974 149 p refs In GERMAN

(RUB-LMRT-4) Avail: NTIS HC $6.00

A new method for the synthesis of control systems based on single-step prediction control is discussed. It is shown that classical methods of synthesis by optimization are inefficient. The theory for single-step control is developed from the reciprocity hypothesis. System perturbations are taken into account. A two-step prediction control theory is elaborated as preparation for multistep control. Investigations were carried out using a digital computer, and a prediction controller was realized for real time operation. ESA

N76-22961# Westfield Coll., London (England). Dept. of Physics.

LOCAL PROPERTIES IN RAPIDITY IN THE MULTI PERIPHERAL PICTURE

N. Murai Nov. 1975 46 p refs Sponsored by UK Sci. Res. Council

Avail: NTIS HC $4.00

Two-particle correlations at fixed multiplicity and rapidity gap distribution in two-particle collisions are discussed. By making statistical assumptions, attempts to extend the kinematical domain beyond the strong-ordering limit in the multiperipheral picture were made. The relaxation of the strong-ordering hypothesis lead to an apparent clustering among final particles. An attractive

component of short range in the rapidity was found in two-particle correlations at fixed multiplicity and in the distribution of gap lengths between adjacent secondaries. In addition the qualitative consistency of the model with the average track number per zone associated with local compensation of charge are discussed. Author (ESA)

N76-22962# Wisconsin Univ., Madison. Mathematics Research Center.
A GENERAL THEORY OF OBSERVATION AND CONTROL
Szymon Dolecki Aug. 1975 72 p refs
(Contract DAAG29-75-C-0024)
(AD-A017962; MRC-TSR-1519) Avail: NTIS CSCL 12/1

This report explores the duality relationships between observation and control in an abstract Banach space setting. Preservation of observability and controllability in the presence of certain perturbations is studied in the context of differential equations in Banach space. Some attention is also given to the problem of optimal reconstruction of system states from observations. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N76-22963 Maryland Univ., College Park.
MODELLING OF CONCURRENT CONTROL STRUCTURES AND PARALLEL PROCESSING Ph.D. Thesis
Jeffry Wen-Hu Yeh 1975 262 p
Avail: Univ. Microfilms Order No. 76-8460

A comprehensive mode is presented that is powerful enough to express desired interactions among parallel processes and to determine the correctness properties (such as proper termination, deadlock-free, self-regulation, determinacy, and equivalency) of a system of interacting parallel processes. The primary focus of attention is on concurrent control structures of these interacting parallel processes. The results are the development of a bounded G-net as a comprehensive model for studying the properties of concurrent control structures, and the development of procedures for modelling parallel processes that can be used in the design and implementation of a reliable computer system. Dissert. Abstr.

N76-22964 Syracuse Univ., N.Y.
FACTORIZATION OF SINGULAR, SECOND-ORDER, LINEAR BOUNDARY VALUE PROBLEMS Ph.D. Thesis
Joseph Carroll Hintz 1975 111 p
Avail: Univ. Microfilms Order No. 76-7589

The numerical solution of the singular, second-order linear differential equation, which is subject to a variety of boundary conditions and singularities is considered. The boundary conditions studied are the Dirichlet boundary conditions and a generalization of the mixed Dirichlet-Neumann boundary conditions. Only differential equations and boundary conditions were considered which had a continuous solution and sufficient conditions for the existence of such a solution. The method studied, called the method of simple factorization, reduces the boundary value problem to a system of equations which yield a solution to the original problem. Since many of the systems which result are singular, first-order initial value systems, techniques were developed for the numerical integration of singular, initial value systems which include generalizations of: (1) Taylor's algorithm, (2) Runge-Kutta algorithm, (3) explicit multistep methods including the Adams-Bashford method, (4) implicit multistep methods including the Adams-Mouton method, and (5) predictor-corrector methods. Dissert. Abstr.

N76-22965# Glasgow Univ. (Scotland). Dept. of Aeronautics and Fluid Mechanics.
NON-LINEAR DIFFERENTIAL EQUATIONS HAVING BOTH CUBIC DAMPING AND STIFFNESS
A. W. Babister Jan. 1976 36 p refs
(Rept-7601) Avail: NTIS HC $4.00

The nature of solutions of an autonomous equation is considered. Trajectories in the phase plane are given for various combinations of signs of b sub 0, Nu, c sub 1 and c sub 3. Limit cycles are shown to occur if c sub 1 and c sub 3 have opposite signs. Their stability was investigated. Author

N76-22966# Montpellier Univ. (France). Dept. de Physique Mathematique.
POSITIVITY CONSTRAINTS IN LINEAR INVERSE PROBLEMS
P. C. Sabatier Oct. 1975 32 p refs
(PM/75/16) Avail: NTIS HC $4.00

A method is given which completely solves linear inverse problems with positive constraints. The convex set of all equivalent solutions is the convex hull of its extremes. A strategy is given to obtain these extremes in a natural order, through several applications of well-known algorithms, taking into account all physical information. Similar methods are given to evaluate the range of the set of equivalent solutions, and to manage numerical uncertainties. The choice of a solution inside the set is discussed. Several typical choices are given, and should meet physicists requirements in most of these problems. Author (ESA)

N76-22967# Wisconsin Univ., Madison. Mathematics Research Center.
CARDINAL INTERPOLATION AND SPLINE FUNCTIONS 8. THE BUDAN-FOURIER THEOREM FOR SPLINES AND APPLICATIONS Technical Summary Report
Carl DeBoor and I. J. Schoenberg Jul. 1975 81 p refs
(Contract DAAG29-75-C-0024)
(AD-A017996; MRC-TSR-1546) Avail: NTIS CSCL 12/1

The Budan-Fourier theorem is shown to furnish the precise sign-structure of several functions appearing in cardinal spline interpolation and its applications. Author (GRA)

N76-22968# Wisconsin Univ., Madison. Mathematics Research Center.
COLLOCATION METHODS FOR SINGULAR BOUNDARY VALUE PROBLEMS Technical Summary Report
Frank R. DeHoog and Richard Weiss Aug. 1975 49 p refs
(Contract DAAG29-75-C-0024; Grant NSF MPS-72-00381)
(AD-A017997; MRC-TSR-1547) Avail: NTIS CSCL 12/1

The application of collocation methods based on piecewise polynomials to the numerical solution of boundary value problems for systems of ordinary differential equations with a singularity of the first kind is examined. The schemes are shown to be stable and convergent. Enhanced accuracy at the nodes for suitably chosen collocation points (superconvergence) is established for a class of important problems. Author (GRA)

N76-22969# Kent State Univ., Ohio. Dept. of Mathematics.
GEOMETRIC CONVERGENCE OF RATIONAL APPROXIMATIONS TO e TO THE -z POWER IN INFINITE SECTORS Interim Report
E. G. Saff, R. S. Varga, and W. C. Ni 1975 35 p refs
Sponsored in part by Univ. of South Florida Res. Council
(Grants AF-AFOSR-2729-74; AT(11-1)-2075; AF Proj. 9749)
(AD-A017687; AFOSR-75-1547TR) Avail: NTIS CSCL 12/1

In this paper, the authors study the geometric convergence of rational approximations to e to the (z) power in infinite sectors symmetric about the positive real axis. GRA

N76-22970# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
CLASSIFICATION AND ESTIMATION OF GROWTH CURVES, A BAYESIAN APPROACH
Jack Chao Mar. 1975 29 p refs
(AD-A011594; ARL-75-0025) Avail: NTIS CSCL 12/1

Classification of observations and estimation of parameters in growth curves are considered from a Bayesian viewpoint. Two different covariance matrices are described. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N76-22971*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
SIMULATION TECHNIQUES FOR ESTIMATING ERROR IN THE CLASSIFICATION OF NORMAL PATTERNS
Stephen J. Whitsitt and David A. Landgrebe 1974 31 p refs (Grant NGL-15-005-112)
(NASA-CR-147137; LARS-IN-040174) Avail: NTIS HC $4.00 CSCL 12A

Methods of efficiently generating and classifying samples with specified multivariate normal distributions were discussed. Conservative confidence tables for sample sizes are given for selective sampling. Simulation results are compared with classified training data. Techniques for comparing error and separability measure for two normal patterns are investigated and used to display the relationship between the error and the Chernoff bound. Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N76-22972# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
MODELING OF TECHNICAL PROCESSES, ESPECIALLY NOTING MODEL SIMPLIFICATION REQUIREMENTS FOR CONTROL AND SUPERVISION [MODELLBILDUNG TECHNISCHER PROZESSE UNTER BESONDERER BERUECKSICHTIGUNG DER BEI REGELUNG UND UEBERWACHUNG BENOETIGTEN MODELLVEREINFACHUNG]
Klaus Gwinner 25 Feb. 1975 140 p refs In GERMAN
Avail: NTIS HC $6.00

A comprehensive representation is provided of mathematical model simplification methods for technical processes. Two possible modeling methods based on physical conservation laws and on Lagrange equations are considered. Methods for model reduction are discussed, and the methods for order reduction of linear models is especially dealt with. ESA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N76-22973 Rutgers Univ., New Brunswick, N.J.
ON FINITE GROUPS WITH A 2-LOCAL SUBGROUP WHICH IS A NONTRIVIAL SPLIT EXTENSION OF E SUB 2 SUB GROUP 4 BY (L SUB 4)(2) Ph.D. Thesis
Gerard Francis Kiernan 1975 166 p
Avail: Univ. Microfilms Order No. 76-7302

Finite simple group G is studied that contains an elementary Abelian subgroup A such that (N sub G)(A) is isomorphic to the nontrivial split extension of A by (L sub 4)(2). Such a group is called an ExL group. For E, a subgroup of (N sub G)(A), isomorphic to the central product of three dihedral groups of order 8, let H = (N sub G)(E). It is then shown that there are only 5 possible types of ExL groups determined by the possibilities of conjugate of H isomorphic, m to a subgroup of S sub 8. Dissert. Abstr.

N76-22974 Auburn Univ., Ala.
CONCERNING TWO HOMOGENEITY PROPERTIES OF TOPOLOGICAL SPACES AND UNIMORPHISMS Ph.D Thesis
Judy Anita Kennedy 1975 47 p
Avail: Univ. Microfilms Order No. 76-2599

A homogeneity property that is weaker than countable dense homogeneity, a homogeneity property that is stronger than representability, and unimorphisms of certain classes of spaces were studied. In particular, with the weaker countable dense homogeneity property an analog to one known theorem on countable dense homogeneity and a generalization of another are obtained. In the next section the concept of isotopic representability is defined, and it is shown that any product of compact, Hausdorff, isotopically representable spaces is isotopically representable, even though it is not the case that any product of compact, Hausdorff, representable spaces is representable. In the last section it was shown that in a uniform space all homeomorphisms from the space onto itself are unimorphisms with respect to the uniformity defined by the collection of all continuous pseudo-metrics on the space, and in a metric space, each homeomorphism is a unimorphism with respect to some metric on the space that is compatible with its topology.
Dissert. Abstr.

N76-22975# Princeton Univ., N.J. Plasma Physics Lab.
TENSOR TRANSFORMATION TECHNIQUE FOR THE TRANSPORT EQUATION
S. L. Gralnick Oct. 1975 33 p refs
(Contract F(11-1)-3073)
(MATT-1154) Avail: NTIS HC $4.75

A stepwise tensor transformation technique is presented for the transformation of the single energy group transport equation to an arbitrary spatial coordinate system. Both gradient and divergence forms of the equation are given, and the same method is applied to the derivation of the diffusion approximation. It is demonstrated that using an orthogonal representation of the propagation vector will simplify the divergence form of the equation. The application of this technique is in the representation of the transport equation in coordinate systems other than the usual rectangular, cylindrical and spherical ones. Its use is demonstrated by transforming the transport equation to a toroidal coordinate system consisting of nested circular toroids.
Author (NSA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

No abstracts in this category.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N76-22976*# Boeing Co., Wichita, Kans.
ANALYTICAL AND EXPERIMENTAL STUDIES OF AN OPTIMUM MULTISEGMENT PHASED LINER NOISE SUPPRESSION CONCEPT Final Report
David T. Sawdy, Roy J. Beckemeyer, and John D. Patterson May 1976 128 p refs
(Contract NAS3-18550)
(NASA-CR-134960; D3-9812-1) Avail: NTIS HC $6.00 CSCL 20A

Results are presented from detailed analytical studies made to define methods for obtaining improved multisegment lining performance by taking advantage of relative placement of each lining segment. Properly phased liner segments reflect and spatially redistribute the incident acoustic energy and thus provide additional attenuation. A mathematical model was developed for rectangular ducts with uniform mean flow. Segmented acoustic fields were represented by duct eigenfunction expansions, and mode-matching was used to ensure continuity of the total field. Parametric studies were performed to identify attenuation mechanisms and define preliminary liner configurations. An optimization procedure was used to determine optimum liner impedance values for a given total lining length, Mach number, and incident modal distribution. Optimal segmented liners are presented and it is shown that, provided the sound source is well-defined and flow environment is known, conventional infinite duct optimum attenuation rates can be improved. To confirm these results, an experimental program was conducted in a laboratory test facility. The measured data are presented in the

form of analytical-experimental correlations. Excellent agreement between theory and experiment verifies and substantiates the analytical prediction techniques. The results indicate that phased liners may be of immediate benefit in the development of improved aircraft exhaust duct noise suppressors. Author

N76-22977*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE REDUCTION TESTS OF LARGE-SCALE-MODEL EXTERNALLY BLOWN FLAP USING TRAILING-EDGE BLOWING AND PARTIAL FLAP SLOT COVERING
Daniel J. McKinzie, Jr., Robert J. Burns, and Jack M. Wagner Washington Apr. 1976 65 p refs
(NASA-TM-X-3379; E-8598) Avail: NTIS HC $4.50 CSCL 20A

Noise data were obtained with a large-scale cold-flow model of a two-flap, under-the-wing, externally blown flap proposed for use on future STOL aircraft. The noise suppression effectiveness of locating a slot conical nozzle at the trailing edge of the second flap and of applying partial covers to the slots between the wing and flaps was evaluated. Overall-sound-pressure-level reductions of 5 db occurred below the wing in the flyover plane. Existing models of several noise sources were applied to the test results. The resulting analytical relation compares favorably with the test data. The noise source mechanisms were analyzed and are discussed. Author

N76-22978*# Hersh Acoustical Engineering, Chatsworth, Calif.
EFFECT OF GRAZING FLOW ON STEADY-STATE RESISTANCE OF ISOLATED SQUARE-EDGED ORIFICES Final Report
Thomas Rogers Washington NASA Apr. 1976 59 p refs (Contract NAS3-17858)
(NASA-CR-2681) Avail: NTIS HC $4.50 CSCL 20A

Steady state diagnostic testing of an isolated orifice has shown the nature of the interaction between grazing and orifice flow causing the large increase in orifice resistance for both inflow and outflow. A simple inviscid interaction model is developed which uses thin aerofoil theory to account for pressure forces exerted at the interface between the orifice and grazing flow together with a one-dimensional discharge coefficient concept. The effect of grazing flow boundary layer thickness is also included in the model. Resistance measurements for each orifice tested, over a wide range of grazing flow speeds and flow rates, collapse into a single curve when plotted in terms of effective discharge coefficient against orifice to grazing velocity ratio. The correlation curves for inflow and outflow are different. Data for clustered orifices collapse in the same way as those for the single orifice. The effect of boundary layer thickness is compared with model predictions. Author

N76-22979# European Space Agency, Paris (France).
THE RELATIONSHIP BETWEEN THE ACOUSTIC FIELD OF A HOT JET AND ITS TURBULENCE AND INFRARED EMISSION
Jean-Francois AmphouxdeBelleval Feb. 1976 123 p refs Transl. into ENGLISH of 'Relation du Champ Acoustique d'un Jet Chaud avec sa Turbulence et son Emission Infrarouge', ONERA, Paris Report ONERA-P-159, 1974
(ESA-TT-248; ONERA-P-159) Avail: NTIS HC $5.50

Various theoretical models permit the calculation of the noise radiated by an element of a turbulent volume from a knowledge of the characteristic parameters of this turbulence (turbulence intensity, convection velocity, length and time scales). In order to obtain these values in the case of a hot jet it was necessary to develop special diagnostic equipment and signal processing methods that are adapted to the measurement of the local infrared emission of this jet. Space-time correlations were carried out in the jet using the crossed-beam technique. The laws for the variations of the characteristic turbulence parameters measured by this method in subcritical and supercritical hot jets are similar to those obtained by hot wire methods in cold jets of low velocity. A digital computer program was produced for the sound field based on these turbulence measurements and has made possible a comparison of the measured and calculated field. Correlation measurements between the acoustic radiation and the infrared emission have in addition made it possible to locate with accuracy the sound sources in the jet. Author (ESA)

N76-22980# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.
NOTE ON AERO-ACOUSTIC MEASUREMENTS IN OPEN-JET WIND TUNNELS
H. V. Fuchs 1974 29 p refs
(DLR-IB-357-74/4) Avail: NTIS HC $4.00

Sound measurements in a turbulent air flow are discussed. Problem areas include acoustic contamination, turbulent flow pressures, and probe flow interference. Possible probe developments for in-flow noise measurements are indicated, and a short survey of activities in pressure fluctuation and sound measurements inside airflows is given. ESA

N76-22981# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
WET NIGHT VISIBILITY STUDY Final Report, 1967 - 1975
W. R. Tooke, Jr. and D. R. Hurst Jul. 1975 240 p refs Sponsored by GA. Dept. of Transportation
(PB-247706/5) Avail: NTIS HC $8.00 CSCL 13B

Apparatus and methods developed for characterization of roadway delineation systems are described, and laboratory and field tests are reported for a selection of eleven retroreflective systems. Hot sprayed and hot extruded thermoplastic striping applied in the standard marking pattern and in other patterns, asphalt bonded granite aggregate overcoated with white beaded paint, asphalt bonded Sinopal aggregate, button reflectors, and GDOT's standard white beaded traffic paint were included in a full factorial field study. Both visual effectiveness and maintenance studies were performed, and the effects of snow-plow damage were assessed. GRA

N76-22982# National Bureau of Standards, Washington, D.C.
MEASUREMENT METHODOLOGY AND SUPPORTING DOCUMENTATION FOR PORTABLE AIR COMPRESSOR NOISE Final Report
Curtis I. Holmer Jan. 1975 48 p refs
(PB-248097/8; NBSIR-75-653) Avail: NTIS HC $4.00 CSCL 13G

Recommendations and supporting rationale are presented on a measurement methodology for portable air compressors. The methodology provides for the determination of A-weighted sound power level or the equivalent weighted sound pressure level at a reference distance. A-weighted level is used because of its correlation with community response to noise from internal combustion engine noise. The methodology uses weighted sound level measurements at eight positions on a curved surface surrounding the source at a distance of one metre from the surface of the machine. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N76-22983 Oklahoma State Univ., Stillwater.
RADIATION DAMAGE IN KMgF3 Ph.D. Thesis
John Everett Rhoads 1974 149 p
Avail: Univ. Microfilms Order No. 76-9755

Electron paramagnetic resonance studies of hole centers were performed on the insulating material KMgF3. Paramagnetic point defects were induced in this material at 77 K with 1.5 MeV electrons from a Van de Graaff Electrostatic accelerator. The perturbed self-trapped hole center found was studied to ascertain a model for this point defect. Hyperfine parameters, g values, and bond angles were calculated by rigorous computer diagonalizations of the complex Hermitian matrix obtained by use of the appropriate spin Hamiltonian. The EPR spectra of a perturbed interstitial type point (H sub A) were observed. The production study of this defect at 77 K revealed a requirement for large doses, in analogy with the corresponding H sub A center in alkali halides. The basis for referring to the observed center as an H sub A center lies in the observed thermal stability and the finding that the principal axes of the three A tensors do not coincide with major crystallographic axes. The center was also

observed to exhibit a pronounced restricted interstitial motion at temperatures above 30 K, leading to an alternating linewidth effect. Dissert. Abstr.

N76-22984 State Univ. of New York, Stony Brook.
ASPECTS OF CONDUCTIVITY THEORY Ph.D. Thesis
Gabriel Dov Degani 1975 182 p
Avail: Univ. Microfilms Order No. 76-7355

A cluster expansion is derived for the time correlation function of the quantal total current operator of an N body system. Associating the N particle system with N solute particles in solution, using an appropriately chosen classical limit and employing several assumptions concerning the solute-solute and solute-solvent interactions, the quantal cluster expansion is converted to a classical expansion, identical to Friedman's expansion (12), (13), and describing a system of N brownian solute particles interacting hydrodynamically and electrostatically among themselves. Dissert. Abstr.

N76-22985# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
MODEL KINETIC EQUATIONS FOR STRUCTURELESS POLYATOMIC MOLECULES WITH PHENOMENOLOGICAL ENERGY EXCHANGE
D. I. Pullin 1975 33 p refs
(Contract SRC-B/RG/4313)
(IC-Aero-75-10) Avail: NTIS HC $4.00

Models of the Boltzmann collision integral are developed for polyatomic structureless spherical molecules subject to certain classes of phenomenological energy exchange between participating energy modes in binary collisions. For the models considered the existence of a class of 'pseudo inverse' collisions leads to a detailed balancing principle and to an H-theorem. Recently proposed special models of the exchange process are discussed in the light of the present formalism and extensions of these are developed. Methods for determining disposable parameters in such models are also briefly discussed. Author (ESA)

N76-22986# Radiation Research Associates, Inc., Fort Worth, Tex.
SYSTEM OF SHIP-SHIELDING CODES INRADS Final Report, 18 Apr. 1973 - 30 Jun. 1974
J. M. Newell, L. G. Mooney, and R. B. Livesay 22 May 1975 75 p refs
(Contract DNA001-73-C-0211; DNA Proj. NWED-QAXPB050) (AD-A011133; RRA-T7410; DNA-3538F) Avail: NTIS CSCL 18/6

A system of three machine codes was developed to calculate the protection against initial radiation from nuclear weapons that may be afforded aboard ship. The codes are written in FORTRAN and are operational on the CDC 6600 computer using SCOPE 3.4 software. Each code is briefly described. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N76-22987 Pittsburgh Univ., Pa.
THEORETICAL STUDIES OF HIGH-TEMPERATURE SPIN DYNAMICS IN SOME SIMPLE MAGNETIC MODELS Ph.D. Thesis
Amit Sur 1975 87 p
Avail: Univ. Microfilms Order No. 76-8823

Ab initio calculations were performed to obtain the exact infinite temperature time correlation functions for finite linear chains containing N spins for N = 5, 7, 9, 11 where the spin-spin interaction is described by an anisotropic Heisenberg model. The effect of increasing the range of dipolar interaction was carefully examined for a one-dimensional system of nuclear spins for which the various transverse spin correlation functions were studied. Results for the moments of the nuclear magnetic resonance line shape with those of other workers were compared. Results for the nuclear magnetic resonance free induction decay of fluorine resonance in Fluorapatite are shown to be in very good agreement with previous experiments. A mean field like theory is worked out for the broad line nuclear magnetic resonance spectra in solids. Good agreement is obtained with free induction decay experiments in CaF2, for the short-time region. Dissert. Abstr.

N76-22988# Battelle Pacific Northwest Labs., Richland, Wash.
FISSION PRODUCT NUCLEAR DATA OBTAINED BY USE OF AN ON-LINE MASS SPECTROMETER
P. L. Reeder, J. F. Wright, and R. A. Anderl 29 Jan. 1975 28 p refs Presented at the Nucl. Cross Sect. and Tech., Washington, D. C.
(Contract AT(45-1)-1830)
(BNWL-SA-5243; Conf-750303-64) Avail: NTIS HC $4.50

A Spectrometer for On-Line Analysis of Radionuclides (SOLAR) has been installed at a 1 MW TRIGA reactor at Washington State University. Fission product ions from a combination target/ion source located within the thermal column are brought out to a 60 deg magnetic sector mass spectrometer. Surface ionization provides copious beams of Rb and Cs ions and less intense beams of Br and I ions with negligible contamination by other elements. About 40 fission product nuclides can thus be chemically and physically separated in times of less than 1 second. Past results on independent and cumulative fission yields along with measurements of half-lives of some very neutron-rich nuclides are presented. Current work on delayed-neutron emission probabilities and energy spectra of delayed neutrons from individual nuclides is described. (7 tables, 2 figures). Author (NSA)

N76-22989# Montpellier Univ. (France). Dept. de Physique Mathematique.
SEMICLASSICAL ANALYSIS OF OPTICAL MODEL AMBIGUITIES
Michel Cuer Sep. 1975 34 p refs
(PM/75/15) Avail: NTIS HC $4.00

Ambiguities in the inverse problem at fixed energy in quantum mechanics are analyzed in the framework of the WKB method. A classification is given. At overcritical energies, the ambiguities are of pure quantum kind and all solutions with a given asymptotic form are bounded (except maybe at the origin). Furthermore, in the asymptotic region the difference between two solutions (equivalent potentials) changes sign infinitely often. At subcritical energies, there are new ambiguities of a semiclassical or classical kind, but, at these energies in classical mechanics, there are ambiguities without analogues in quantum mechanics. The classical ambiguities are not bounded and numerical results are given. The imaginary part of the potential is introduced by successive perturbations. The ambiguities of the optical model are studied: the VRp(V) = constant ambiguities may be explained by the tunnel effect. Author (ESA)

N76-22990# Oregon State Univ., Corvallis. Dept. of Nuclear Engineering.
EVALUATION OF FISSION PRODUCT AFTER-HEAT Quarterly Report, Jul. - Sep. 1975
B. I. Spinrad Jan. 1976 37 p refs Sponsored by Nucl. Regulatory Commission
(PB-248628/0; NUREG-0018-1) Avail: NTIS HC $4.00 CSCL 18G

Specific tasks covered in this report are: (1) Neutron capture in fission products, with the preliminary result that this effect does not lead to a major change in decay power of real reactors for shutdown times less than 1,000 seconds; (2) a fission product decay heat standard; (3) a presentation of the errors in the above standard; (4) initial work on more precise estimates of errors in decay energies of fission products, and on estimating gamma spectra of unmeasured fission product transitions; (5) pretest predictions of calorimetric decay heat experimental results; and (6) neutron emission from primary fission products. GRA

74 OPTICS

Includes light phenomena.

N76-22991*# Old Dominion Univ., Norfolk, Va.
EVALUATION OF TRANSMITTANCE OF SELECTED INFRARED BANDS
S. K. Gupta and S. N. Tiwari Apr. 1976 36 p refs
(Grant NsG-1153)
(NASA-CR-147116; TR-76-T7) Avail: NTIS HC $4.00 CSCL 20F

Computer programs were developed for evaluating homogeneous path transmittance with line-by-line and quasi-random band model formulations. Spectral transmittances for some selected bands of different gases (CO, N2O, CO2, H2O) were obtained using these programs. Results of theoretical computations are compared with available experimental measurements. Significant errors are observed in the results obtained from a quasi-random band model formulation, indicating that it is inadequate to meet the accuracy requirements for atmospheric work. Author

N76-22992# Royal Aircraft Establishment, Farnborough (England).
A COMPUTER PROGRAM FOR STATISTICS OF LINE OF SIGHT IN A TERRAIN
Jacob Palme Dec. 1975 111 p refs Transl. into ENGLISH of "Datamackin program foer Sikstatistik i Terraeng", Rept. FOA-P-C-8189-13 Foersvarets Forskningsanstalt, Stockholm, 1968
(RAE-Lib-Trans-1750; BR51726; FOA-P-C-8189-13) Avail: NTIS HC $5.50

The program described takes input data from a TERROR-chart (a matrix of height values obtained from the terrain). The program sets out different flight profiles for given observer positions on the charts, and the line of sight between the aircraft and the observer is calculated. The program carries out statistics of line of sight by calculating sight probability, circular sight interruption rate and radial sight interruption rate. The data values for the controlling parameters are taken from another report describing the intervisibility tracking generator. The program outputs sighting data on punched cards, or on magnetic tape, which can be used by a subsequent program, e.g. TUT-3 and TERROR-MOD.2, for anti aircraft studies. Author

N76-22993* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTICAL ALIGNMENT DEVICE Patent Application
Norman L. Thomas, inventor (to NASA) (LMSC, Sunnyvale, Calif.) Filed 28 Apr. 1976 14 p Sponsored by NASA
(NASA-Case-ARC-10932-1; US-Patent-Appl-SN-681001) Avail: NTIS HC $3.50 CSCL 20F

A patent application was presented for an invention whose principal objective is the provision of an improved alignment device for observing the degree of coalignment of a pair of objects. The device includes a beamsplitter to be interposed between a pair of objects for observing the degree of coalignment. Light from one of the objects is reflected from the beamsplitter into a retroreflector which reflects the light back through the beamsplitter into an imaging system. Light from the other object is reflected from the beamsplitter into the same imaging system. The amount of displacement of the two images is inversely related to the degree of coalignment of the two objects. The optical alignment device is useful for aligning a mirror with an object, two objects or two mirrors. Author

N76-22994# Recherches et Etudes d'Optique et de Sciences Connexes, Ballainvilliers (France).
TRANSFER FUNCTION OF A RITCHEY-CHRETIEN TELESCOPE WITH MINOR DISPLACEMENT [FONCTION DE TRANSFER D'UN RITCHEY-CHRETIEN EN PRESENCE D'EXCENTREMENT]
J. L. Mercier 13 Oct. 1975 6 p In FRENCH; ENGLISH summary
Avail: NTIS HC $3.50

The modulation transfer function (MTF) was computed in the case of tilting and displacement of the convex mirror. Application of the MTF calculation to the algebraic determination of the actual meridian line of a mirror and for weighted mechanical tolerances are outlined. ESA

N76-22995# Dayton Univ. Research Inst., Ohio.
MAXIMUM LIKELIHOOD SOLUTION TO THEODOLITE DATA Contract Report
Lawrence A. Jehn and Jerry B. Reeves May 1975 237 p refs
(Contract N00178-70-C-0056)
(AD-A011150; NSWC/DL-CR-71-100) Avail: NTIS CSCL 17/8

Theodolite procedures are briefly reviewed and the method of the Naval Surface Weapons Center, Dahlgren Laboratory is discussed in detail. Errors of closure of the individual solution points are calculated. A criterion for the rejection of erroneous data from individual theodolite stations is included. Statistical procedures are included which establish a reliable estimate of the variance of the position coordinates based on the errors of closure of the solution points. A FORTRAN 4 program is described which has a number of options which makes it convenient for the user to adapt it to his particular needs. A unique feature is the tabulator plot of the errors of closure. The program is operational on the IBM 7094 and 7030 systems. Author

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N76-22996 Kentucky Univ., Lexington.
CONFINED ELECTRIC ARC WITH LOCAL FLUID CONSTRICTION Ph.D. Thesis
Hsi-Sheng Hsia 1975 254 p
Avail: Univ. Microfilms Order No. 76-7726

The effects of local fluid constriction (LFC) on a wall-stabilized, cascaded argon arc at atmospheric pressure are examined. The construction of the arc column is achieved by introducing a portion of the working gas to the arc discharge through a narrow circumferential slit in the confining duct wall. Measurements on electric field intensity and wall heat flux are performed for the inlet, fully-developed, and redeveloping regions for a wide range of operating conditions. Axial plasma temperature distribution in the region of radial injection is measured. Spectrometric technique is used for obtaining the radial temperature profiles of the arc-plasma. Electric and thermal characteristics of the confined argon arc with and without local fluid constriction are compared at identical operating conditions. Application of LFC forces the fully developed arc column to redevelop downstream of the injection reduced with LFC, improving the energy conversion efficiency. Dissert. Abstr.

N76-22997 Maryland Univ., College Park.
MEASUREMENT OF HYDROGEN n-ALPHA STARK PROFILES IN A TURBULENT PLASMA Ph.D. Thesis
Tsu-Jye Abraham Nee 1975 115 p
Avail: Univ. Microfilms Order No. 76-8418

Two hydrogen n-alpha transitions, n = 13 yields 12 at lambda 88.7 microns and n = 12 yields 11 at lambda 69.0 microns were observed in a large diameter theta discharge at electron densities between 10 to the 14th power and 10 to the 15th power -cu cm. Line profiles were measured with a Czerny-Turner infrared monochromator and a Ge:Ga photodetector at liquid helium temperature. Both n-alpha lines exhibit strong and symmetric satellite profiles, with intensities comparable to their parent lines and displacements close to the electron plasma frequency. This can be interpreted in terms of plasmon-atom collisions if long wavelength fluctuations in this turbulent plasma are enhanced. As an independent estimate for the level of turbulence, the continuum emission in the regions corresponding to electron plasma and 2 (electron plasma frequency) was measured, and found to be well above the level expected for a thermal plasma. Comparison with the fluid theory, after radiative transfer corrections, shows an excellent consistency with the n-alpha satellite diagnostics. Dissert. Abstr.

N76-22998 Dartmouth Coll., Hanover, N.H.
TURBULENT HEATING IN A BEAM PLASMA SYSTEM Ph.D. Thesis

Michael Roy Mross 1976 94 p
Avail: Univ. Microfilms Order No. 76-9023

A study of turbulent excitation and heating in a moderate energy beam plasma system was made. The system behavior in the strong interaction limit was classified into three regimes. In one, diffusive heating of thermal electrons was found to be the dominant dissipation mechanism of the beam driven electrostatic turbulence. A model describing the system behavior in this regime was developed. It consists of a coupled set of three rate equations for the intensity of the unstable field fluctuations, the plasma density and the electron temperature. Dissert. Abstr.

N76-22999*# Iowa Univ., Iowa City.
HIGH-BETA TURBULENCE IN TWO-DIMENSIONAL MAGNETOHYDRODYNAMICS
David Fyfe and David Montgomery Dec. 1975 27 p refs Submitted for publication
(Grant NGL-16-001-043)
(NASA-CR-147119; U-of-Iowa-75-44) Avail: NTIS HC $4.00 CSCL 20I

Incompressible turbulent flows were investigated in the framework of ideal magnetohydrodynamics. Equilibrium canonical distributions are determined in a phase whose coordinates are the real and imaginary parts of the Fourier coefficients for the field variables. The magnetic field and fluid velocity have variable x and y components, and all field quantities are independent of z. Three constants of the motion are found which survive the truncation in Fourier space and permit the construction of canonical distributions with three independent temperatures. Spectral densities are calculated. One of the more novel physical effects is the appearance of macroscopic structures involving long wavelength, self-generated, magnetic fields ('magnetic islands'). In the presence of finite dissipation, energy cascades to higher wave numbers can be accompanied by vector potential cascades to lower wave numbers, in much the same way that in the fluid dynamic case, energy cascades to lower wave numbers accompany entropy cascades to higher wave numbers. Author

N76-23000# Sandia Labs., Albuquerque, N.Mex.
COUPLED ELECTRON/PHOTON TRANSPORT IN STATIC EXTERNAL MAGNETIC FIELDS
J. A. Halbleib, Sr. and W. H. Vandevender Jul. 1975 8 p refs Presented at the IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Arcata, Calif.
(SAND-75-5231; Conf-750703-6) Avail: NTIS HC $4.00

A model is presented which describes coupled electron/photon transport in the presence of static magnetic fields of arbitrary spatial dependence. The method combines state-of-the-art condensed-history electron collisional Monte Carlo and single-scattering photon Monte Carlo, including electron energy-loss straggling and the production and transport of all generations of secondaries, with numerical field integration via the best available variable-step-size Runge-Kutta-Fehlberg or variable-order/variable-step-size Adams PECE differential equation solvers. A three-dimensional cartesian system is employed in the description of particle trajectories. Although the present model is limited to multilayer material configurations, extension to more complex materials geometries should not be difficult.
Author (NSA)

N76-23001# Princeton Univ., N.J. Plasma Physics Lab.
IMPURITY TRANSPORT IN A QUIESCENT TOKAMAK PLASMA
S. A. Cohen, J. L. Cecchi, and E. S. Marmar Oct. 1975 14 p refs
(Contract E(11-1)-3073)
(MATT-1152) Avail: NTIS HC $4.00

Short bursts of aluminum were injected into the Adiabatic Toroidal Compressor (ATC) Tokamak, and measured the time evolution of the radial distributions of highly ionized states of aluminum. The results are compared with a computer code describing neoclassical impurity diffusion, and good agreement is found. Author (NSA)

N76-23002# Princeton Univ., N.J. Plasma Physics Lab.
TOKAMAK ENGINEERING TEST REACTOR
R. W. Conn and D. L. Jassby Jul. 1975 36 p refs
(Contract E(11-1)-3073)
(MATT-1155) Avail: NTIS HC $5.00

The design criteria for a Tokamak engineering test reactor can be met by operating in the two component mode with reacting ion beams, together with a new blanket shield design based on internal neutron spectrum shaping. A conceptual reactor design achieving a neutron wall loading of about 1 MW/sq m is presented. The Tokamak has a major radius of 3.05 m; the plasma cross section is noncircular with a 2:1 elongation; and the plasma radius in the midplane is 55 cm. The total wall area is 149 sq m. Author (NSA)

N76-23003# Princeton Univ., N.J. Plasma Physics Lab.
REACTOR APPLICATIONS OF TWO-COMPONENT TOKAMAK PLASMAS
F. H. Tenney Oct. 1975 20 p refs
(Contract E(11-1)-3073)
(MATT-1161) Avail: NTIS HC $4.00

The physics of two energy component toroidal plasmas is reviewed. Energy breakeven using the TCT mode (deuteron beams on a triton target plasma) can be attained at much smaller n tau and temperature than in thermal plasma operation. This result reflects the fact that the fusion power density in a TCT can be much larger than in a thermal DT plasma of the same pressure. The large fusion power density (i.e., large neutron flux) of a TCT may find practical use in a number of applications.
Author (NSA)

N76-23004# California Univ., Livermore. Lawrence Livermore Lab.
LASER-PELLET HEATING STUDIES FOR PLASMA-TARGET PRODUCTION
J. E. Osher and G. D. Porter 9 Sep. 1975 30 p refs
(Contract W-7405-eng-48)
(UDIC-16872) Avail: NTIS HC $4.00

Laser heating of a small pellet to produce an initial plasma target for subsequent energetic neutral beam trapping and buildup is a relatively new application of laser technology to controlled fusion, magnetic confinement experiments. Simple theories explaining the laser pellet heating interaction suggest two laser heating methods: either a few nanoseconds duration, intense laser pulse on a carefully preheated small pellet, or a sufficiently long laser pulse to allow ablative burn-through of a larger, initially cold pellet. The ablative burn approach is favored because of the availability of relatively inexpensive CO2 lasers with pulse lengths in the 50-ns range. The theory for this model is briefly described and its predictions compared with supporting calculations made with the LASNEX computer code. Preliminary experiments are also described in which a nominally 250J CO2 laser was used to provide a 45- to 100-ns pulse incident on one side of a 100-mu m-diam polystyrene pellet. Author (NSA)

N76-23005# Rijksuniversitair Centrum te Antwerpen (Belgium).
GENERAL SCIENTIFIC CONFERENCE OF THE BELGIAN SOCIETY OF PHYSICS
1975 98 p refs In ENGLISH and several other languages Conf. held at Antwerp, Belgium, 2-3 Jun. 1975
(Conf-7506664) Avail: ERDA Depository Libraries HC $8.00

Abstracts from the Belgian Physical Society meeting are given. Papers were presented on the following subjects: physics of the solid state, 39; physics of plasmas, 9; atomic and molecular physics, 10; nuclear physics, 22; elementary particle physics 12; and astrophysics and geophysics, 5. GRA

N76-23006# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.
MEASUREMENT METHODS FOR THE PLASMA OF THE TFR TOKOMAK
C. Etievant Feb. 1975 52 p refs In FRENCH
(EUR-CEA-FC-764) Avail: ERDA Depository Libraries HC $5.75

The diagnostic techniques used to study the main parameters of the plasma of TFR (electron and ion temperature, current density), the electrical behavior of the discharge, the densities of neutral gas, and of impurities, and the parameters of plasma turbulence are reviewed. Author (NSA)

N76-23007# United Kingdom Atomic Energy Authority, Abingdon (England).
TRANSIT TIME MAGNETIC PUMPING EXPERIMENTS IN THE PROTO-CLEO STELLARATOR
W. Millar Apr. 1975 21 p refs
(CLM-R-144) Avail: ERDA Depository Libraries HC $4.25; UK 50 pence

Experiments are described in which magnetic field perturbations at frequencies 100 kHz, of the type required for transit time magnetic pumping, are applied to the PROTO-CLEO stellarator. The chief effect is an increase in the plasma loss rate, which is investigated. The importance of electrostatic fields is discussed, and attention is drawn to the possibility of operating in a region not explored here, with long wavelength and low frequency. Author (NSA)

N76-23008# Sandia Labs., Albuquerque, N.Mex.
TWO DIMENSIONAL MHD MODELING OF COMPRESSED MAGNETIC FIELD GENERATORS. 1: THE MAGNETIC FIELD SOLVER
J. R. Freeman and S. L. Thompson Sep. 1975 44 p refs
(Contract AT(29-1)-789)
(SAND-75-0375) Avail: NTIS HC $5.25

An effort to construct a 2-D magnetohydrodynamics code to study the dynamics of compressed magnetic field (CMF) generators has begun. This report describes the magnetic field solver portion of the code. The solver employs variable zoning designed to provide resolution with a minimum number of meshes, and incorporates flux-corrected transport to reduce spurious numerical diffusion. Comparisons with analytic results for 1-D test cases are presented, as well as 2-D results from a test of a realistic generator configuration. Author (ERA)

N76-23009# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON THE AXIALLY SYMMETRIC EQUILIBRIUM OF A MAGNETICALLY CONFINED PLASMA
B. Lehnert 22 Oct. 1975 19 p refs
(TRITA-EPP-75-23) Avail: NTIS HC $3.50

The axially symmetric equilibrium of a magnetically confined plasma was considered in order to study high beta schemes with a purely poloidal magnetic field. A number of special solutions of the pressure and magnetic flux functions were shown to exist. The obtained results may form starting points in a further analysis of physically relevant configurations. Author (ESA)

N76-23010# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
STABILIZATION OF LOCALIZED MODES IN PLASMAS CONFINED IN POLOIDAL MAGNETIC FIELDS
T. Hellsten Oct. 1975 18 p refs
(TRITA-EPP-75-24) Avail: NTIS HC $3.50

The plasma contained in a spherator system with a pure poloidal magnetic field and a surrounding gas blanket can be made absolutely stable against magnetohydrodynamic perturbations in the low beta limit. This situation can even be achieved for a sufficiently high ratio between the pressures in the thermonuclear region and the cold boundary region to satisfy reactor conditions, provided that the outer plasma boundary is chosen close to a separatrix. Author (ESA)

N76-23011# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON THE STABILIZATION OF FLUTE-TYPE DISTURBANCES OF A MAGNETIZED PLASMA
B. Lehnert 23 Nov. 1975 17 p refs
(TRITA-EPP-75-25) Avail: NTIS HC $3.50

Flute-type disturbances in a low beta plasma being confined to the field of a straight line current were investigated by normal mode analysis. A dispersion relation and stability criterion were derived including the joint effects of the plasma pressure, the finite ion Larmor radius and frequency, and of an imposed radial gravitational field. The results indicate that the stability domain is enlarged substantially by finite Larmor radius effects, especially for small scale disturbances. Also the centrifugal force in rotating plasmas should have a stabilizing effect under certain conditions. In combination with the stabilizing mechanisms in the boundary regions of impermeable plasmas, the present results provide an alternative to the method of minimum-average-B stabilization. Author (ESA)

N76-23012# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
NONLINEAR MOTION OF PLASMAS IN A STRONG ELECTROMAGNETIC FIELD
Nguyen TheHung Sep. 1975 13 p refs Sponsored by Swiss Natl. Sci. Found.
(LRP-89/75) Avail: NTIS HC $3.50

A plasma subjected to a strong electromagnetic field with a finite wavelength is considered and a method of obtaining the nonlinear plasma current in all orders of this field presented; both electrostatic and electromagnetic perturbations are considered. The basic equations for the nonlinear motion of a plasma are described. Nonlinear plasma velocity and density are calculated. It is shown that the nonlinear response of a plasma in a strong electromagnetic field can be obtained in a simple way and results obtained can be applied to studies of wave-wave interaction in any order of the strong field; they can also be generalized to the case of hot, multicomponent plasma. ESA

N76-23013# European Space Agency, Paris (France).
A SIMPLE COMPUTATION OF ELECTRON DISTRIBUTION FUNCTIONS WITH INELASTIC COLLISIONS
William P. Allis Feb. 1976 19 p refs Transl. into ENGLISH of 'Calcul Simple des Fonctions de Distribution d'Electrons faisant des Collisions Inelastiques', ONERA Paris Report ONERA-NT-234, 1974
(ESA-TT-261; ONERA-NT-234) Avail: NTIS HC $3.50

A nitrogen plasma is considered, in the presence of an electric field sufficient to induce inelastic collisions. The electrons of the plasma are in a permanent state of flux. This up flux G(u) is a convenient function being related on the one hand to the energy distribution f(u) by a differential expression and on the other to the inelastic collision rate K(u) f(u) by an integral expression. When the excitation cross-sections are represented by delta-functions the up flux is constant between deltas and the distribution function is a broken curve of simple analytic sections. Net excitation rates are then obtained from a set of linear equations. Author (ESA)

N76-23014# European Space Agency, Paris (France).
ELECTRON LOSS PROCESSES IN A PLASMA CONTROLLED BY A BEAM OF HIGH ENERGY ELECTRONS
Perla Gotchiguian Dec. 1975 36 p refs Transl. into ENGLISH of 'Processus de Perte d'Electrons dans un Plasma Controle par Faisceau d'Electrons Energetiques', ONERA, Paris Report ONERA-NT-236, 1974
(ESA-TT-226; ONERA-NT-236) Avail: NTIS HC $4.00

The loss of plasma electrons in an electron beam sustained discharge was investigated. An electric field is continuously maintained between the electrodes. The ratio E/N between this field and the neutral molecule density varies from 5 x 10(sup-19) to 2 x 10(sup-16)Vsq cm. Electronegative impurities, dissorbed from the discharge chamber walls during operation in nitrogen, were revealed. Voluntary introduction of small quantities of air and oxygen permitted evaluation by extrapolation, within about 0.001 of the ratio between the density of the electronegative particles thus created and that of neutral nitrogen molecules. A simple computer program, taking into account the constants of probable attachment reactions and the measured coefficient of electron-ion recombination, permitted evaluation, within about 0.01 of the ratio between the negative ion density and that of plasma electrons. Within investigated ranges of pressure and of electron density the dissociative electron-ion recombination remains the dominant process of electron loss in the plasma. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N76-23015 Texas Univ., Austin.
THE EFFECTS OF PRESSURE AND TEMPERATURE ON THE dc AND ac CONDUCTIVITIES OF HEAVILY DOPED AMORPHOUS SEMICONDUCTORS Ph.D. Thesis
Paul LaVon Sherrell 1975 175 p
Avail: Univ. Microfilms Order No. 76-8107

A number of theories, which were proposed to explain ac conductivities in disordered materials, are compared. The predicted temperature and pressure dependences of both the ac and dc conductivities and ac dielectric constants are discussed. The methods of sample preparation are presented with special consideration given to problems of preparing samples for electrical transport measurements. The designs of high pressure systems which were used are described, and the advantages, capabilities, and the operational techniques and problems are compared for the different systems. The dc conductivities of a number of Te-As-Ge glasses as functions of pressure and temperature were measured. Numerous attempts were made to observe frequency-dependent conductivity in these glasses and in a number of other bulk glasses for which it was reported in thin film samples. Dissert. Abstr.

N76-23016 Utah Univ., Salt Lake City.
THE DIELECTRIC BEHAVIOR OF CLASSICAL AND QUANTUM-MECHANICAL DIPOLE DEFECTS IN ALKALI HALIDE CRYSTALS UNDER FIELD AND STRESS Ph.D. Thesis
Jochen Wahl 1975 180 p
Avail: Univ. Microfilms Order No. 76-6667

Dielectric constant and loss measurement over a wide frequency range and under various geometries of bias field and stress were used at low temperature to study the static and dynamic properties of several defect systems. The extended experimental material on molecular dipoles (OH-) and off-center-point-ion-dipoles (F- and Li+) with <100>, <111> and <110> symmetries in various host materials is compared to detailed model calculations. For the cases with strong tunneling, the classical permanent dipole model breaks down and quantum-mechanical effects appear in the dielectric loss behavior. For the <111> oriented Li+ defect, bi-axial stress in a (111) plane produces an experimental example of a simple two-well potential with atomic tunneling through the central barrier, which allows for the first time to measure a Debye relaxation together with the corresponding tunneling parameter. Dissert. Abstr.

N76-23017 Pittsburgh Univ., Pa.
SCATTERING OF CONDUCTION ELECTRONS FROM A CONTAMINATED METAL SURFACE Ph.D. Thesis
Douglas Louis Lessie 1975 125 p
Avail: Univ. Microfilms Order No. 76-8809

A conduction electron's probability of specular reflection and higher order diffraction from an atomically smooth but contaminated metal surface is calculated. The average t-matrix approximation is used to obtain the average surface scattered electron wave function and current density. The effects of multiple scattering between absorbed impurities and of evanescent waves at the surface are especially considered. A resonance in the specular probability that is associated with both multiple scattering and the presence of a diffracted wave is found. Calculations suggest a qualitative distinction in the specular probability curves corresponding to attractive and repulsive adsorbed impurities. Dissert. Abstr.

N76-23018 Wisconsin Univ., Madison.
PULSE PROPAGATION ON SUPERCONDUCTIVE TUNNEL TRANSMISSION LINES Ph.D. Thesis
Stanley Arthur Reible 1975 255 p
Avail: Univ. Microfilms Order No. 75-29831

Pulse propagation on superconductive transmission lines which support normal electron tunnel currents and also those which support superelectron (Josephson) tunnel currents is analyzed. A method of realizing a refractory (R-T) junction is proposed and demonstrated with the lumped circuit model. This refractory junction is an essential element in the realization of neuristor logic functions and details are presented on its application. Threshold conditions for neuristor excitation are also studied using the conservation law for magnetic flux as a key concept. Numerical and analytic analysis indicates that the initial pulse velocity on the Josephson line is an increasing function of the magnitude (V) of the exciting voltage applied to one end of the transmission line and asymptotically approaches the phase velocity of an electromagnetic wave in the junction cavity when V is made large. Pulse attenuation on the Josephson line approaches the value that is observed on a linear transmission line. Dissert. Abstr.

N76-23019 Texas Technological Univ., Lubbock.
THE ANALYSIS OF THE STEADY-STATE THERMAL AND ELECTRICAL BEHAVIOR OF A SILICON METAL-OXIDE-SEMICONDUCTOR FIELD EFFECT TRANSISTOR Ph.D. Thesis
Lex Alan Akers 1975 124 p
Avail: Univ. Microfilms Order No. 76-7358

Rapid advancements in the field of semiconductor technology has prompted the need for detailed and accurate analysis of these devices. Exact mathematical models necessary to study such devices consist of very complex nonlinear, coupled, partial differential equations. Numerical techniques with high speed digital computers offer the ability to generate very general forms of solutions. A one-dimensional mathematical model of a MOSFET device was developed including the effects of temperature and various spatial parameters and its steady-state characteristics studied. Finite difference approximations were introduced and an algorithm was developed to solve the steady-state majority carrier transport equation and the nonlinear steady-state heat conduction equation. Dissert. Abstr.

N76-23020 Syracuse Univ., N.Y.
A SURFACE FORMULATION FOR CHARACTERISTIC MODES OF MATERIAL BODIES Ph.D. Thesis
Yu Chang 1974 124 p
Avail: Univ. Microfilms Order No. 76-7887

A theory of characteriatic modes for material bodies is developed using equivalent surface currents. The mode currents form a weighted orthogonal set over the material body surface, and the mode fields form an orthogonal set over the sphere at infinity. The characteristic modes of material bodies have most of the properties of those for perfectly conducting bodies. Formulas for the use of these modes in electromagnetic scattering problems are given. A procedure for computing the characteristic modes is developed, and applied to two-dimensional bodies. Illustrative examples of the computation of characteristic currents and scattering cross sections are given for cylinders of different material constants. An additional approach for computing the scattering cross sections is also given, based on the method of moments. The operator equations are reduced to matrix equations, and the current is found by matrix inversion. Scattering cross sections are computed by an additional matrix multiplication with a measurement matrix. Dissert. Abstr.

N76-23021 Rutgers Univ., New Brunswick, N.J.
A STUDY OF TIME-DEPENDENT SUPERCONDUCTIVITY BY THE HARMONIC GENERATION TECHNIQUE Ph.D. Thesis
Joseph Cono Amato 1975 118 p
Avail: Univ. Microfilms Order No. 76-7264

The dynamics of the superconducting order parameter were studied experimentally by the harmonic generation technique. In this technique, the superconductor is placed in a microwave magnetic field, and the small third-harmonic signal generated by the superconductor is measured with a sensitive, fully phase-coherent, superheterodyne detector. The equipment necessary to observe the harmonic effect is described in detail, with special emphasis on the design of the dual-mode microwave cavity which houses the sample. The selection of the sample system is discussed, and sample preparation is described in detail. The results of two alloys are in good agreement with the predicted theoretical results of Gor'Kov and Eliashberg (GE). Deviations from the theoretical temperature dependence are discussed, and a modification to the GE theory is suggested to explain the long relaxation times observed. Dissert. Abstr.

N76-23022 Duke Univ., Durham, N.C.
ELECTROHYDRODYNAMIC INSTABILITIES IN SOME THIN HOMOGENEOUS LIQUID CRYSTALLINE MATERIALS Ph.D. Thesis

Elizabeth Carol Ellis 1975 184 p
Avail: Univ. Microfilms Order No. 76-8736

An alternating electric field applied across a thin film of a mesomorphic phase may initiate one of several electro-hydrodynamic instabilities in the mesophase depending upon both the microscopic (i.e., molecular) and macroscopic properties of the compound as well as the experimental conditions of the observation. This investigation correlates the electrooptical behaviors of four liquid crystalline compounds and, for their nematic mesophases, compares the experimental observations to the predictions of the Orsay model. To make the comparisons with the Orsay theory, some electrical properties of the mesophases are also measured. Dissert. Abstr.

N76-23023 Duke Univ., Durham, N.C.
THE DIELECTRIC CONSTANTS OF SOLID HELIUM, HYDROGEN, DEUTERIUM, AND NEON Ph.D. Thesis
David Glen Haase 1975 148 p
Avail: Univ. Microfilms Order No. 76-8745

The results are presented in terms of normalized molar polarizabilities as functions of temperature and, in the hydrogens, as a function of J = 1 molecular concentration. The samples had melting pressures from five to 800 atmospheres. The temperature range of data was from 0.4K to 15K. Data was taken with two different capacitance measuring systems. With Cell 1, the low pressure sample cell, the circuit was driven by a tunnel diode oscillator operating at 16 MHz. With Cell 2, the high pressure system, the capacitance was determined with a commercial capacitance bridge operating at 4.0 kHz. These two methods allowed determinations of changes in the Clausius-Mosotti polarizability precise to one part in 10 to the 6th power. Experimental considerations involved in such high precision measurements in solids having dielectric constants on the order of unity are discussed. Dissert. Abstr.

N76-23024 Texas Univ., Austin.
THE EFFECT OF PRESSURE ON THE GLASS TRANSITION AND THE ISOTHERMAL COMPRESSIBILITY OF AMORPHOUS SEMICONDUCTORS Ph.D. Thesis
Bennett Anderson Joiner, Jr. 1975 125 p
Avail: Univ. Microfilms Order No. 76-8053

The glass transition temperature was measured as a function of pressure for the amorphous semiconductors As2S3, Te15Ge2As3, and Cd6Ge3As11 using the transit time of an ultrasonic pulse to detect the glass transition. These measurements were compared to predictions from the free volume theory of the glass transition. In the first two cases, the glass transition temperature first increased and then levelled off with the increasing pressure, as predicted by the free volume theory. The third semiconductor exhibited anomalous behavior: the glass transition temperature first increased with pressure, but at the relatively low pressure of 1.5 kbar the glass transition temperature began to decrease with increasing pressure. The traditional theories of the glass transition temperature are unable to explain this behavior. The isothermal compressibilities of several glasses also were measured and compared with adiabatic compressibilities obtained from ultrasonic measurements. As a general trend for a series of glasses, the compressibilities decrease with increasing glass transition temperature. Dissert. Abstr.

N76-23025 Ohio Univ., Athens.
LATTICE MODEL THEORY OF THE EQUATION OF STATE COVERING GAS, LIQUID AND SOLID PHASES Ph.D. Thesis
Eliseo Moreno Chan 1975 112 p
Avail: Univ. Microfilms Order No. 76-8848

This investigation is confined to classical, thermodynamic, single-component phase transformations. The model proposed was the rigid lattice gas model of Horiguchi and Tanaka. Patterned after Lennard-Jones and Devonshire's theory, a simple cubic lattice containing two fcc sublattice (alpha and beta) was adopted. To closely describe the noble gas atoms (specifically argon), the Lennard--Jones (6-12) potential was used for the pair interaction. The cluster variation method was employed to describe the lattice part of the free energy. The Weiss and the pair approximations, which are the lowest orders of approximations, were applied on the lattice gas and examined. It was observed that these approximations could not give the correct phase diagrams and phase transitions even with the addition of a free volume term which accounted for the motion of atoms about the lattice sites. Dissert. Abstr.

N76-23026 North Carolina Univ., Chapel Hill.
CONDUCTION MECHANISM IN BETA ALUMINA CRYSTALS Ph.D. Thesis
Ghaffari Mehdi 1975 122 p
Avail: Univ. Microfilms Order No. 76-9248

Potential energy curves for various carrier ions in beta alumina were calculated. All ions except the carrier ions Li(+), Na(+), Ag(+), K(+), Rb(+), Cs(+) were assumed fixed in their equilibrium positions. These ionic positions were taken from Roth's work. The motion of carrier ions is restricted on lines of the two dimensional hexagonal network. The site energy difference between the anti-Beevers-Ross site and the Beevers-Ross site is approximately two electron volts in stoichiometric crystals. In nonstoichiometric crystals, the extra carrier ions may be paired to form interstitialcy pairs. The potential energy barriers for the in-phase motion of the interstitialcy pairs are found to be comparable to the experimental activation energies. Attempt frequencies were calculated, and a simple random walk model is used for the electrical conductivities. Dissert. Abstr.

N76-23027# Case Western Reserve Univ., Cleveland, Ohio.
SOLID STATE PHYSICS PROGRAM Final Report
Jun. 1975 33 p refs
(Contract AT(11-1)-623)
(COO-623-207) Avail: NTIS HC $4.75

During the 17 year period of this research, experimental and theoretical investigations were completed in many aspects of cohesive properties of metals and alloys and dielectric properties of various crystals and glasses together with the temperature and pressure derivatives of both properties. Studies of the magnetization and magnetic anisotropy indicate superparamagnetism is common in oligatomic condensed films and any decreased magnetic moment must be associated with surface atoms. Large intrinsic stresses are associated with growth morphology and impurities at grain boundaries. Transport properties in normal metals have been investigated theoretically. A number of basic theorems for disordered systems were derived. Author (NSA)

N76-23028# Brookhaven National Lab., Upton, N.Y.
PERFORMANCE OF Nb3Sn MULTIFILAMENTARY SUPERCONDUCTORS IN SOLENOIDAL MAGNETS
W. B. Sampson, M. Suenaga, and K. E. Robins [1976] 5 p refs Presented at the Conf. on Magnet Technol., Frascati, Italy, 21 Apr. 1975 Sponsored by ERDA
(BNL-19962; Conf-750444-2) Avail: NTIS HC $4.00

High current Nb3Sn multifilamentary conductors are formed by heat treating cables braided from three types of composite wire. In the simplest configuration, these wires contain niobium filaments in a pure copper matrix. After braiding, the conductor is coated with a layer of tin which diffuses through the copper during heat treatment to form Nb3Sn filaments. The second configuration is made from wires containing niobium filaments in a copper-tin alloy and requires only heat treatment to form the Nb3Sn filaments. The third type of the braid has wires which consist of groups of niobium filaments in the bronze matrix which are in turn in a copper matrix. Tantalum barriers surround each group of filaments to prevent the tin from contaminating the pure copper matrix. The cables are wound into solenoids after heat treatment, and the effect of mechanical handling is studied by monitoring the resistive voltage distribution in the coils. Author (NSA)

N76-23029# Sandia Labs., Albuquerque, N.Mex. Solid State Electronics Div.
TECHNIQUE FOR SPUTTERING TRANSPARENT CdS AND CdZnS PHOTOCONDUCTIVE FILMS
J. B. Snelling Aug. 1975 20 p refs
(Contract AT(29-1)-789)
(SAND-75-0466) Avail: NTIS HC $4.00

A method of RF sputtering high quality cadmium sulfide and cadmium-zinc sulfide photoconductive thick films was developed. The light/dark film resistivity typically differs by 6 orders of magnitude. Films are very transparent, adhere well to a variety of optically polished substrates, and do not require

the usual postdeposition anneal to obtain high dark resistivity.
Author (ERA)

N76-23030# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
NUMERICAL SOLUTION OF THE ONE-DIMENSIONAL MODEL EQUATION FOR BIPOLAR TRANSISTORS
D. H. Ferriss Oct. 1975 42 p refs
(NPL-NAC-61) Avail: NTIS HC $4.00

To predict performance of semiconductor devices and provide information such as the effects of particles or electromagnetic radiation on these devices by numerical modelling the numerical solution by finite differences of a sixth order system of nonlinear partial differential equations which represent a one-dimensional transistor model under transient conditions is described. The equations are formulated, and the solution obtained in terms of the hole and electron quasi-Fermi potentials. In contrast to the usual Gummel algorithm the discretized partial differential equations are linearized using the Newton-Raphson technique and solved simultaneously. Author (ESA)

N76-23031# Interuniversitair Reactor Instituut, Delft (Netherlands).
MEASUREMENTS OF IONIC MOBILITIES IN DIELECTRIC LIQUIDS BY MEANS OF CONCENTRIC CYLINDRICAL ELECTRODES
A. O. Allen, M. P. deHaas, and A. Hummel 1976 27 p refs
(IRI-133-76-01) Avail: NTIS HC $4.00

When a liquid, placed in an electric field between coaxial cylindrical electrodes, is ionized uniformly by a short pulse of X-rays, the current resulting from the subsequent motion of the inward-moving ions decays with time differently from that due to the outward-moving ions. This effect provides a convenient method, described in detail, for assigning mobilities to the positive and negative ions present. Mobilities were determined as a function of temperature for the ions formed in dilute solutions of the electron-trapping molecules SF6, CH3I, CH3Br, CH3Cl or O2 in cyclohexane or 2,2,4-trimethyl pentane. In all these cases the negative ions were more mobile than the positive. Only one major negative ion mobility and one major positive ion mobility was to be seen in the solutions, with the exception of O2 in 2,2,4-trimethyl pentane, which gave two negative ions of different mobilities. Author (ESA)

N76-23032# European Space Agency, Paris (France).
SHAPE AND SURFACE EFFECTS IN SMALL SUPERCONDUCTORS
Henri Morand Jan. 1976 180 p refs Transl. into ENGLISH of 'Effets de Forme et de Surface dan les Petits Supraconducteurs' ONERA, Paris Report ONERA-P-152, 1973
(ESA-TT-239; ONERA-P-152) Avail: NTIS HC $7.50

A close analogy was established between the thermodynamic properties of vortices in hard superconductors whose characteristic size satisfies xi(T) less than d less than lambda (T). The model was applied to the case of a thin film and to that of a circular cylinder in a parallel field. The anisotropy of the nucleation field was analyzed for the case of d less than xi (T), and experimental results obtained on tin whiskers are presented. Depairing properties and the resistivity which results from thermodynamic fluctuations in unidimensional superconductors immersed in an intense magnetic field are discussed.
Author (ESA)

N76-23033# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
ANOMALIES IN THE PROPERTY RELATIONSHIPS TENDING TO REINFORCE HIGH TEMPERATURE SUPERCONDUCTIVITY IN CHOLATES
S. Goldfein Nov. 1974 38 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-A009005; USAMERDC-01901-21-PMMR) Avail: NTIS CSCL 20/12

A relationship was previously shown between the transition temperature Tc, the isotope effect and the number of valence electrons per atom for a homologous series of the sodium salts of hydroxy cholanic acids (cholates). Further relationships are shown between Tc of these cholates and such significant properties of superconductors as the lower critical magnetic field, Deybe temperature and the specific heat at constant pressure Cp. Plots of Delta Cp/Delta T vs T uncovered a possible other high temperature superconductor with a Tc = 450K which would be active only in a domain of the molecule. A structure of such a molecule and possibilities of synthesizing a bulk high temperature superconductor based on it are discussed. GRA

N76-23034# Cornell Univ., Ithaca, N.Y.
ADVANCED CONCEPTS OF MICROWAVE GENERATION AND CONTROL IN SOLIDS Biannual Report, 1 May - 31 Oct. 1974
G. C. Dalman, L. F. Eastman, C. A. Lee, and J. Frey Sep. 1975 170 p refs
(Contract F30602-74-C-0001; AF Proj. 5573)
(AD-A016947; RADC-TR-75-177; BAR-2) Avail: NTIS CSCL 09/1

The emphasis of the investigation is centered on studies of active microwave effects in avalanche diodes, transferred electron diodes, microwave field-effect transistors, and on related microwave circuit, materials growth, and physical electronic techniques. In Section A, a report is made on the microwave solid state devices and circuits. Included are: Amplifier Properties; IMPATT Diode Load Characteristics; Interaction of Distributed IMPATT Oscillators; An IMPATT Diode Characterization; Microwave Transistor Studies; Compound Semiconductor Transistor Study; Computer Experiments in TRAPATT Diodes; and High Performance TEO. In Section B, a report is made on materials and fabrication techniques. The topics discussed are: The Epitaxial Growth of Thin GaAs Layers; Read Structures; and Electric-Current-Controlled Liquid Phase Epitaxial Growth of GaAs. GRA

N76-23035# California Univ., Los Angeles. School of Engineering and Applied Science.
LONG TERM MEMORY IN JUNCTION DEVICES USING MULTIVALENT TRAPPING IMPURITIES IN SILICON Semiannual Report, 1 Sep. 1974 - 31 Jan. 1975
J. W. Holm-Kennedy, G. Domingo, and W. Kingsley Aug. 1975 62 p refs
(Contract DAAB07-73-C-0306; DA Proj. 1S7-62705-AH-94)
(AD-A016939; UCLA-ENG-7550; ECOM-73-0306-3) Avail: NTIS CSCL 09/1

Various multivalent dopants were investigated with the goal of obtaining nonvolatile multilevel memory devices in silicon using the Field Induced Trapping (FIT) effect. The test structures included Schottky diodes and resistive bars fabricated in silicon substrates suitably doped with multivalent dopants. Novel device effects were observed and are described. A model for a negative differential resistance Schottky barrier oscillator is proposed.
GRA

N76-23036# Army Electronics Command, Fort Monmouth, N.J.
ALTERATION OF TEMPERATURE COEFFICIENTS IN MASS-LOADED CRYSTAL VIBRATORS
Arthur Ballato Oct. 1975 14 p
(DA Proj. 1S7-62705-AH-94)
(AD-A016916; ECOM-4360) Avail: NTIS CSCL 09/1

Effects of mass-loading and harmonic on the resonance and antiresonance temperature behavior of a piezoelectric plate vibrator are described, in the one dimensional approximation, for thickness- and lateral-field excitation. Applications to rotated-Y-cut quartz cuts are given. GRA

N76-23037# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
INVESTIGATION OF TECHNOLOGICAL PROBLEMS IN GaAs Semiannual Technical Report
Fred H. Eisen, John A. Higgins, Anthony A. Immorlica, Reidar L. Kuvas, and Burt W. Ludington 25 Jul. 1975 116 p refs
(Contract F19628-75-C-0113; ARPA Order 2489)
(AD-A018090; SC5017.4SAR; SAR-1; AFCRL-TR-75-0435) Avail: NTIS CSCL 20/12

Various technological problems in the development of GaAs microwave devices are covered in this report. The work reported here includes epitaxial growth of high-resistivity and multiple ultra-thin films, study of the relationship between device performance and material parameters using FETs and p-n junctions, study of noise and impact ionization coefficients in

IMPATT structures under high electrical field, preparation of high-quality oxide films for surface passivation, growth of semi-insulating substrates, and characterization techniques and study of ion implantation as a tool for microwave device fabrication. The activities and the progress made during the six-month period are described in separate sections. GRA

N76-23038# North Carolina Univ., Chapel Hill. Dept. of Physics and Astronomy.
WORKSHOP ON DEFECTS IN MAGNESIUM OXIDE AND RELATED MATERIALS Final Report
J. H. Crawford, Jr. May 1975 69 p refs Workshop held at Mount Pisgah, North Carolina, 26-28 May 1975
(Grant NSF DMR-75-08078)
(PB-248473/1) Avail: NTIS HC $4.50 CSCL 20L

MgO and other alkaline earth oxides are a very important class of materials which are now just beginning to be investigated in the same depth as the alkali halides. The production of defects in MgO and how they influence the electronic structure is an important topic since these materials have applications in various technologies including radiation damage, surface studies and oxidation, and ionization changes. A table is given which summarized the work done up to the present time. GRA

N76-23039# Auburn Univ., Ala.
DIELECTRIC BREAKDOWN IN SOLIDS Final Report, 1 Nov. 1973 - 31 Aug. 1975
Paul P. Budenstein 16 Oct. 1975 19 p refs
(Grant DAHC04-74-G-0047)
(AD-A018550; ARO-12068.1-RTL) Avail: NTIS CSCL 20/12

A theoretical model of dielectric breakdown in solids has been proposed by Budenstein. In this model the breakdown process starts with the development of a critical local charge density. This density, in turn, causes chemical bonds to be broken and leads to the formation of a high density gaseous plasma, the conducting path for destructive breakdown. The present work explores the magnitude of the critical charge density by comparison of the bonding energies of the H2(+), H2, H2(-) and H2(--) molecules. An ab initio calculation of the ground state of the H2(--) molecule is performed and is the major contribution of this work. The implications of this calculation on the breakdown problem and on other problems are discussed. GRA

N76-23099* Massachusetts Inst. of Tech., Cambridge.
INTERFACE MARKINGS IN CRYSTALS EXPERIMENT MA-060
H. C. Gatos and A. F. Witt *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 8 p (For availability see N76-23074 13-88)
CSCL 20B

N76-23101* Rensselaer Polytechnic Inst., Troy, N.Y.
CRYSTAL GROWTH FROM THE VAPOR PHASE EXPERIMENT MA-085
H. Wiedemeir, H. Sadeek, F. C. Klaessig, and M. Norek *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 20 p refs (For availability see N76-23074 13-88)
CSCL 20B

N76-23104* Rockwell International Science Center, Thousand Oaks, Calif.
CRYSTAL GROWTH EXPERIMENT MA-028
M. D. Lind *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 9 p refs (For availability see N76-23074 13-88)
Avail: NTIS CSCL 20B

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N76-23040 State Univ. of New York, Buffalo.
ON THE THERMODYNAMICS OF NONLINEAR SINGLE INTEGRAL REPRESENTATIONS FOR THERMOVISCOELASTIC MATERIALS WITH APPLICATIONS TO ONE-DIMENSIONAL WAVE PROPAGATION Ph.D. Thesis
Weilin Parrish Chang 1975 55 p
Avail: Univ. Microfilms Order No. 76-9041

Thermodynamic theory was used to develop single integral constitutive relations for the nonlinear thermoviscoelastic response to arbitrary stress and temperature histories; the thermomechanically coupled energy equation was also obtained. The thermorheologically simple material, modified superposition and the isotropic stress power law are discussed in detail. A modified Fourier heat conduction law was employed to ensure that the propagation of thermal disturbances took place at a finite velocity. Using the nonlinear thermoviscoelastic stress power law along with the linearized energy equation and modified Fourier law, one-dimensional wave front solutions were obtained. A numerical method for obtaining the field solutions is discussed in detail.
Dissert. Abstr.

N76-23041 Syracuse Univ., N.Y.
THERMODYNAMIC CRITERIA OF HOMOGENEOUS REACTION RATES Ph.D. Thesis
Fikry Louis Lansing 1975 153 p
Avail: Univ. Microfilms Order No. 76-7593

A theoretical analysis of the restrictions imposed by macroscopic equilibrium thermodynamics on rate theories for homogeneous chemical reactions is described. Elementary gas-phase, constant pressure, exothermic reactions are used throughout this rate study. Reaction path, based on the experimental results from combustion processes in flames, is outlined. The sequence of the availability function is studied along this path, subject to the constraints of the laws of thermodynamics for reaction processes. These reveal new thermodynamic rate characteristics that were formerly determined solely by experiment using the Arrhenius form of chemical rate. More-over, the ignition temperatures are predicted using an irreversibility analysis. The limits of these thermodynamic rate parameters show good correspondence with existing measured data even if nonthermodynamic factors such as catalysts, diffusion or branching are accounted for. Dissert. Abstr.

N76-23042# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
HIGH RAYLEIGH NUMBERS CONVECTION IN ENCLOSED FLUID LAYERS WITH INTERNAL HEAT SOURCES
F. A. Kulacki and A. A. Emara Jul. 1975 47 p refs
(Contract E(11-1)-2470)
(PB-247783/4; NUREG-75/065) Avail: NTIS HC $4.00 CSCL 20M

An experimental study of high Rayleigh number natural convection with internal heat sources was conducted in a horizontal fluid layer with an insulated lower boundary and a constant-temperature upper boundary. Average heat transfer coefficients at the upper surface were obtained for Rayleigh numbers up to 2.17 x 10 to the 12th power. Currently available heat transfer correlations for internally heated fluid layers are also reviewed. Correlations are compared using a common definition of Rayleigh number and Nusselt number. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N76-23043# Delaware Univ., Newark. Coll. of Marine Studies.
AN EVALUATION OF MULTI-PURPOSE OFFSHORE INDUSTRIAL-PORT ISLANDS. GENERAL ISLAND CHARACTERISTICS Final Technical Report
P. Swatek May 1975 492 p Prepared in cooperation with Texas A and M Univ., College station, Harris (Frederic R.), Inc. and Gilbert Assoc. Inc.
(Grant NSF GI-43111)
(PB-248335/2; NSF/RA/E-75-054A) Avail: NTIS HC $12.50 CSCL 13B

The possibility of construction of large artificial industrial/port islands to be located off the U.S. Atlantic and Gulf Coasts is evaluated. Market demand and general location options; process description and adaptation study; civil engineering considerations; environmental assessments; and legal/political aspects are discussed. GRA

N76-23044# Delaware Univ., Newark. Coll. of Marine Studies.
AN EVALUATION MULTI-PURPOSE OFFSHORE INDUSTRIAL PORT ISLANDS. MAJOR RESEARCH PROBLEMS AND PROMISING RESEARCH APPROACHES Final Report
P. Swatek May 1975 98 p Prepared in cooperation with Texas A and M Univ., College Station, Harris (Frederic R.), Inc. and Gilbert Assoc., Inc.
(Grant NSF GI-43111)
(PB-248336/0; NSF/RA/E-75-054B) Avail: NTIS HC $5.00 CSCL 13B

Evaluated are economic engineering, legal, and environmental possibilities of large (four to six square mile) artificial industrial/port islands located off the U.S. Atlantic and Gulf Coasts. This volume describes the procedures and results from the workshop which was conducted to identify major problems and promising approaches to solve the problems associated with man made islands. The workshop was divided into the following functional groups: (1) Economics and finance; (2) industrial tenants; (3) environmental; (4) legal and institutional; and (5) structure and construction. GRA

N76-23045# National Bureau of Standards, Washington, D.C.
[HIGHLIGHTS OF MAJOR ACHIEVEMENTS AND UTILIZATION OF RESOURCES DURING FISCAL YEAR 1975] Final Report
Pamela A. Powell and Sharon A. Washburn 1975 34 p Supersedes NBS-SP-418 and COM-75-10465
(PB-248258/6; NBS-SP-437; NBS-SP-418; COM-75-10465) Avail: NTIS HC $4.00 CSCL 05B

The publication highlights the major achievements of the National Bureau of Standards during FY75 and describes how resources were utilized during this period. In addition, the report will contain sections featuring the Bureau's interaction with the public and private sectors and emphasizing the historical perspective in relation to the Bureau's 75th anniversary and the nation's bicentennial. This publication will serve as (1) annual accounting of major NBS activities and (2) promotional information on NBS services and capabilities. Sections of the report feature: Increasing measurement competence; sharing measurement techniques; exploring our energy options; expanding computer utilization; preserving environmental quality; promoting better materials use; improving product safety; providing information as a resource. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N76-23046*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
HEALTH-CARE DISTRICT MANAGEMENT INFORMATION SYSTEM PLAN: REVIEW OF OPERATIONS ANALYSIS ACTIVITIES DURING CALENDAR YEAR 1975 AND PLAN FOR CONTINUED RESEARCH AND ANALYSIS ACTIVITIES Final Report
George J. Nielson and William G. Stevenson Mar. 1976 169 p refs
(Contract NAS9-14815)
(NASA-CR-147579; R-966) Avail: NTIS HC $6.75 CSCL 05B

Operations research activities developed to identify the information required to manage both the efficiency and effectiveness of the Veterans Administration (VA) health services as these services relate to individual patient care are reported. The clinical concerns and management functions that determine this information requirement are discussed conceptually. Investigations of existing VA data for useful management information are recorded, and a diagnostic index is provided. The age-specific characteristics of diseases and lengths of stay are explored, and recommendations for future analysis activities are articulated. The effect of the introduction of new technology to health care is also discussed. Author

N76-23047*# Environmental Research Inst. of Michigan, Ann Arbor.
CENTER FOR REMOTE SENSING INFORMATION AND ANALYSIS Status Report, 1 Oct. 1974 - 29 Feb. 1976
12 Mar. 1976 12 p presented at 10th Intern. Symp. on Remote Sensing of Environment, Ann Arbor, Mich., 6-10 Oct. 1975
(Contract NAS9-14606)
(NASA-CR-147586) Avail: NTIS HC $3.50 CSCL 05B

A brief history and the purpose of the Center are given. The information services provided are described along with the Tenth International Symposium on Remote Sensing of Environment. F.O.S.

N76-23048# National Inst. for Community Development, Inc., Washington, D.C.
HEALTH SERVICE TECHNOLOGY BIBLIOGRAPHIC SERVICE. VOLUME 1: THE STATUS OF THE ACTIVATED PATIENT/CONSUMER CONCEPT Final Report, 22 Jun. 1974 - 20 Jul. 1975
Amelia Davis and Ronald D. Morgan 7 Oct. 1975 87 p
(Contract PHS-HRA-106-74-21)
(PB-247745/3; NCHSR-76/44-Vol-1) Avail: NTIS HC $5.00 HC also available from NTIS $16.00/set of 4 reports as PB-247744-SET CSCL 06E

Activated Patient/Consumer programs are analyzed along specific, defined dimensions and a comprehensive literature review is presented. Background information on the concept augmented by an annotated bibliography is given along with an analytical argument that supports the development of research and demonstration projects to further study the concept. A generic model for Activated Patient/Consumer Concept research and demonstration projects, and a profile of existing Activated Patient/Consumer project experience are included. GRA

N76-23049# National Inst. for Community Development, Inc., Washington, D.C.
HEALTH SERVICE TECHNOLOGY BIBLIOGRAPHIC SERVICE. VOLUME 2: ANALYSIS OF INFORMATION SYSTEMS REQUIREMENTS OF HMO's Final Report, 22 Jun. 1974 - 20 Jul. 1975
Elizabeth Ewing, Thomas Landau, Michael Nowicki, and Ransom Parker 7 Oct. 1975 70 p
(Contract PHS-HRA-106-74-21)
(PB-247746/1; NCHSR-76/45-Vol-2) Avail: NTIS HC $4.50

HC also available from NTIS $16.00/set of 4 reports as PB-247744-SET CSCL 06E

Results are presented of a literature review and a series of consultations relative to requirements for management information systems appropriate and necessary for use by Health Maintenance Organizations (HMO's). Emphasis is given to: (1) conceptual and operational issues relevant to the selection or design of information systems, and (2) examples of systems and components presently in use. A bibliography is included. GRA

N76-23050# National Inst. for Community Development, Inc., Washington, D.C.
HEALTH SERVICE TECHNOLOGY BIBLIOGRAPHIC SERVICE. VOLUME 3: DEVELOPMENT OF A DATA SYSTEM FOR IMPROVING THE EFFICIENCY OF HOSPITAL OUTPATIENT DEPARTMENTS Final Report, 22 Jun. 1974 - 20 Jul. 1975
Elizabeth Ewing 7 Oct. 1975 122 p
(Contract PHS-HRA-106-74-21)
(PB-247747/9; NCHSR-75/46-Vol-3) Avail: NTIS HC $5.50 HC also available from NTIS $16.00/set of 4 reports as PB-247744-SET CSCL 06E

Based on a literature search and survey an analysis was performed of previous and existing work on improving efficiency in outpatient settlings, including other ambulatory care facilities, as well as hospital outpatient departments. Major project variables critical issues, information gaps, proposal and project evaluation criteria, and guidelines for determining priorities for project support are discussed. GRA

N76-23051# Pennsylvania Univ., Philadelphia. Busch Center.
THE SCATT REPORT: A TENTATIVE IDEALIZED DESIGN OF A NATIONAL SCIENTIFIC COMMUNICATION AND TECHNOLOGY TRANSFER SYSTEM Final Report, 1 Jul. 1974 - 1 Jul. 1975
Russell L. Ackoff, Martin C. J. Elton, James C. Emery, Marybeth L. Meditz, and Waldimir M. Sachs 1 Sep. 1975 210 p refs
(Grant NSF GN-41833)
(PB-247242/1) Avail: NTIS HC $7.75 CSCL 05B

The research team has been developing an ideal system for the scientific and technical information enterprise in the United States. The methodology is based on successive revision of a conceptual framework for organizing the flow of information from points of origin to all possible points of application. One of the advantages of this approach is that all affected parties--information generators and users as well as information processers--can help shape the evolving model. Consequently, the ideal system for scientific and technical information, is not the system to be implemented, but represents, instead, a first approximation of what might be possible, within the U.S. decentralized, pluralistic system. GRA

N76-23052# George Washington Univ., Washington, D.C. Program of Policy Studies in Science and Technology.
INNOVATION INFORMATION AND ANALYSIS PROJECT Final Report, 1 Jan. 1973 - 30 Sep. 1975
Vary T. Coates and Jerry D. Priscoli Oct. 1975 24 p
(Grants NSF DA-36681; NSF RDA-73-07227-A03)
(PB-247337/9; NSF/RDA-73-28-1) Avail: NTIS HC $3.50 CSCL 05B

Literature documents were produced (e.g., indexes, abstracts, bibliographies) as part of regular outputs. The formation, operation, and the, point of view of the grantee are described. GRA

N76-23053# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS Technical Report, 1 Jul. 1973
A. B. Whinston Sep. 1975 71 p refs
(PB-247142/3; TR-68) Avail: NTIS HC $4.50 CSCL 13B

A data management system is presented that will aid planners in the implementation of a decision support system which addresses the technical aspects of areawide water quality planning. The basis is the systematic study of the information flows and their relationships to the goals of the water planning group. The data required for the system include: (1) an area description, (2) quality goals, (3) point source data, (4) nonpoint source data, (5) cost information for the various types of treatments, (6) data on land use plans, populations and employment, and (7) design flow of municipal facilities. The system is capable of supporting data bases and models for a wide variety of planning problems in addition to water quality management. GRA

N76-23054# Capital Systems Group, Rockville, Md.
IMPROVING AT THE DISSEMINATION OF SCIENTIFIC AND TECHNICAL INFORMATION: A PRACTITIONER'S GUIDE TO INNOVATION
John M. Strawhorn, Richard L. Omerso, and William A. Creager 15 Apr. 1975 203 p refs
(Contract NSF C-950)
(PB-247057/3) Avail: NTIS HC $7.75 CSCL 05B

The guide's focus is on the primary dissemination of scientific information: the technical journal or its equivalent. In other words, it deals with the initial recorded transmission of information. The guide's contents are organized into sections, according to the degree of departure from conventional journal and monographic publishing. Each section is made up of a number of individual entries, describing particular innovations. So far as possible, these systems are separated into their individual components for treatment in separate entries, so that the reader who wishes to avoid radical change will not be forced to consider innovation in terms of conversion to a totally new system. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N76-23055# Committee on Interstate and Foreign Commerce (U. S. House).
CLEAN AIR ACT AMENDMENTS, 1975, PART 1
Washington GPO 1975 715 p refs Hearings on titles V and VI of H.R. 2633 and H.R. 2650 before Subcomm. on Health and the Environment of Comm. on Interstate and Foreign Commerce, 94th Congr., 1st Sess., 13-14, 17-20, and 26 Mar. 1975
(GPO-50-898) Avail: Subcomm. on Health and the Environment

The hearings concerning the amendments to the Clean Air Act are reported. Amendments considered include the extension of compliance to power plants, and automobile emission standards. Environment protection and economic problems of enforcing the pollution restrictions are discussed along with energy conservation. The health hazards, and mortality rates are estimated for various air pollutions. F.O.S.

N76-23056# Committee on Interstate and Foreign Commerce (U. S. House).
CLEAN AIR ACT AMENDMENTS, 1975, PART 2
Washington GPO 1975 623 p refs Hearings on titles V and VI of H.R. 2633 and H.R. 2650 before Subcomm. on Health and the Environment of Comm. on Interstate and Foreign Commerce, 94th Congr., 1st Sess., 13-14, 17-20, and 26 Mar. 1975
(GPO-50-898) Avail: Subcomm. on Health and the Environment

Additional bills to amend the Clean Air Act are reported. For Part 1, see N76-23055.

N76-23057# Committee on Government Operations (U. S. Senate).

RECYCLING OF PETRODOLLARS
Washington GPO 1974 99 p refs Hearing before Permanent Subcomm. on Investigations of Comm. on Govt. Operations, 93d Congr., 2d Sess., 16 Oct. 1974
(GPO-42-306) Avail: Subcomm. on Investigations

The financial and economic problems that have accompanied the artificial inflation of world oil prices by the OPEC cartel are considered. Emphasis is placed on the concept of recycling-the process by which the oil consumers are expected to borrow back their own money from OPEC in order to buy more oil at inflated prices. Conservation of fuel oil is recommended to decrease the demand for OPEC oil. J.M.S.

N76-23058# Committee on Aeronautical and Space Sciences (U. S. Senate).
NASA AUTHORIZATION FOR FISCAL YEAR 1976 AND THE TRANSITION PERIOD. PART 4: INDEX
Washington GPO 1975 153 p Hearings on S. 573 before Comm. on Aeron. and Space Sci., 94th Congr., 1st Sess., 1975
(GPO-54-609) Avail: SOD HC $1.75

An index is presented to the NASA authorization hearings of FY 1976. J.M.S.

N76-23059# Committee on Armed Services (U. S. House).
FULLY EXPLORE, FULLY DEVELOP, AND PRODUCE THE NAVAL PETROLEUM RESERVES WITH THE REVENUE DERIVED THEREFROM TO BE PLACED IN A SPECIAL FUND FOR SUCH EXPLORATION, DEVELOPMENT, AND PRODUCTION, FOR PRODUCTION TO BE APPLIED TO THE PETROLEUM NEEDS OF THE DEPARTMENT OF DEFENSE AND FOR THE ESTABLISHMENT OF A STUDY GROUP TO INVESTIGATE THE FEASIBILITY OF CREATING A NATIONAL STRATEGIC PETROLEUM (MILITARY), AND FOR OTHER PURPOSES
Washington GPO 18 Apr. 1975 2* p Rept. to accompany H. R. 5919, 94th Congr., 1st Sess., 1[illegible] Apr. 1975
(H-Rept-94-156; GPO-38-006) Avail: US Capitol, House Document Room.

The history and location of the four Naval petroleum reserves are briefly described along with the readiness and deliverability of the oil from each reserve. A summary is included of the proposed legislation to increase domestic energy supply and availability. F.O.S.

N76-23060# Committee of Conference (U. S. Congress).
NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT, 1976
Washington GPO 30 Jul. 1975 14 p Conference Rept. to accompany H.R. 4723, 94th Congr., 1st Sess., 30 Jul. 1975
(H-Rept-94-422; GPO-57-006) Avail: US Capitol, Senate Document Room

The recommendations concerning the Science Foundation's appropriations to the House and Senate are reported. Funding levels and programs are listed. F.O.S.

N76-23061# Committee on Interior and Insular Affairs (U. S. House).
AUTHORIZING THE SECRETARY OF THE INTERIOR TO ESTABLISH ON CERTAIN PUBLIC LANDS OF THE US NATIONAL PETROLEUM RESERVES THE DEVELOPMENT OF WHICH NEEDS TO BE REGULATED IN A MANNER CONSISTENT WITH THE TOTAL ENERGY NEEDS OF THE NATION AND FOR OTHER PURPOSES
Washington GPO 18 Mar. 1975 10 p Rept. of accompany H.R. 49, 94th Congr., 1st Sess., 18 Mar. 1975
(H-Rept-94-81-Pt-1; GPO-38-081) Avail: US Capitol, House Documentation Room

Legislation is presented and discussed that empowers the Secretary of the Interior to promote the exploration and drilling for crude oil in public lands of the United States. Specifically examined is the expansion of production of Naval petroleum reserves in Elk Hills, California, which contain an estimated 1.5 billion barrels of oil, and 1.2 trillion cubic feet of natural gas. The development of oil reserves in Alaska is also discussed. The development of these reserves should help relieve the Nation's dependence on foreign oil, and the energy crisis. J.R.T.

N76-23062# Committee on Armed Services (U. S. House).
AUTHORIZING THE SECRETARY OF THE INTERIOR TO ESTABLISH ON CERTAIN PUBLIC LANDS OF THE UNITED STATES NATIONAL PETROLEUM RESERVES THE DEVELOPMENT OF WHICH NEEDS TO BE REGULATED IN A MANNER CONSISTENT WITH THE TOTAL ENERGY OF THE NATION, AND FOR OTHER PURPOSES
Washington GPO 18 Apr. 1975 27 p Rept. to accompany H.R. 49, 94th Congr., 1st Sess., 18 Apr. 1975
(H-Rept-94-81-Pt-2; GPO-38-006) Avail: US Capitol, House Document Room

For abstract, see N76-23061.

N76-23063# Committee on Commerce (U. S. Senate).
TOXIC SUBSTANCES CONTROL ACT
Washington GPO 1975 365 p refs Hearings on S. 776 before Subcomm. on the Environment of Comm. on Commerce, 94th Congr., 1st Sess., 3, 5, 10 Mar.; 15 Apr. 1975
(GPO-51-715) Avail: Subcomm. on the Environment

Toxic hazards of certain chemical substances are considered. A bill which requires premarket testing of these substances and reporting of the results is proposed. J.M.S.

N76-23064# Committee on Interstate and Foreign Commerce (U. S. House).
ELECTRIC UTILITY PROBLEMS: FUEL ADJUSTMENT CLAUSES
Washington GPO 1975 739 p refs Hearings before Subcomm. on Oversight and Investigations of Comm. on Interstate and Foreign Commerce, 94th Congr., 1st Sess., 1-2 and 5 May 1975
(GPO-54-363) Avail: Subcomm. on Oversight and Investigations

Fuel adjustment clauses used by electric utilities to pass on increased fuel costs to the consumer are discussed. Factors considered include: the position of the state regulatory agencies and the administration of the fuel adjustment clause; the utilities incentive to control costs and operate efficiently; and consumer protection. J.M.S.

N76-23065# Committee on Science and Technology (U. S. House).
AUTHORIZING APPROPRIATIONS FOR THE STANDARD REFERENCE DATA ACT
Washington GPO 14 Mar. 1975 6 p Rept. to accompany H.R. 37, 94th Congr., 1st Sess., 14 Mar. 1975
(H-Rept-94-62; GPO-38-006) Avail: US Capitol, House Document Room

Legislation is presented and discussed that will provide for the compilation (data systems) and dissemination of reference materials to scientists, engineers, and the general public. Federal budgets are outlined for the promulgation of scientific works in the scientific community, and various scientific journals are described. Information pertaining to the chemical and physical properties of materials is emphasized. The role of the National Bureau of Standards in organizing and distributing the information is examined. J.R.T.

N76-23066# Committee of the Whole House on the State of the Union (U. S. House).
AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1974 180 p Rept. to accompany H.R. 4700, 94th Congr., 1st Sess., 14 Mar. 1974
(H-Rept-94-63) Avail: US Capitol, House Document Room

The hearings concerning NASA appropriations for space flight operations for Fiscal Year 1976 are reported. Items discussed include: research and development, construction of facilities, research and program management. F.O.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N76-23067*# Denver Univ., Colo. Program for Transfer Research and Impact Studies.
SPACE BENEFITS: THE SECONDARY APPLICATION OF AEROSPACE TECHNOLOGY IN OTHER SECTORS OF THE ECONOMY
[1975] 141 p refs
(Contract NASw-2766)
(NASA-CR-147216; DRI-5/75) Avail: NTIS HC $6.00 CSCL 05A

Benefit cases of aerospace technology utilization are presented for manufacturing, transportation, utilities, and health. General, organization, geographic, and field center indexes are included. F.O.S.

N76-23068*# Martin Marietta Corp., Denver, Colo.
TRACK-TRAIN DYNAMIC ANALYSIS AND TEST PROGRAM. BARBER S-2 STATIC TEST
Peter W. Abbott Feb 1976 29 p refs
(Contract NAS8-29882)
(NASA-CR-144272; TR-006-S) Avail: NTIS HC $4.00 CSCL 13F

The results of a static test of a Barber S-2 freight truck conducted to measure the stiffness and friction parameters of the modes of deformation which are being used in various mathematical models in the railroad industry were presented. Some difficulty was first experienced with the truck hardware since it was in an essentially new condition with many high spots causing interference. No difficulty was experienced once the interference was removed. The characteristics of the Barber S-2 are very similar to the ASF ride control truck. The major difference between the two trucks is the amount of friction between the bolster and side frames in both the vertical and lateral directions. The Barber S-2 has approximately twice the friction the ASF ride control truck has in the fully loaded condition. This does not necessarily imply that all trucks will have this same ratio of friction. Author

N76-23069*# Technology and Economics, Inc., Cambridge, Mass.
URBAN CONSTRUCTION AND SAFETY PROJECT Final Report
Peter T. Hogarth Feb. 1976 118 p refs
(Contract NAS9-14529)
(NASA-CR-147581) Avail: NTIS HC $5.50 CSCL 13B

Technology utilization projects in the area of urban construction and safety included the following: development of undercarpet and baseboard flat conductor cables, flood insurance studies, tornado safety engineering, the Project TECH house at the Langley Research Center, assistance to the City of Atlanta in their environmental habitability and resource allocation program, and market assessment of a solid state diesel engine controller. The flat conductor cable and the flood insurance studies are given particular attention. Author

N76-23070# Committee on Public Works (U. S. Senate).
TRANSPORTATION PLANNING AND PRIORITIES FOR THE SEVENTIES, DETROIT, MICHIGAN, PART 3
Washington GPO 1974 106 p refs Hearing before Subcomm. on Transportation of Comm. on Public Works, 93d Congr., 2d Sess., 29 Mar. 1974
(GPO-32-833) Avail: Subcomm. on Transportation

The hearings are reported concerning the national transportation policy with emphasis on (1) financing highways and mass transit, (2) transportation in a time of energy shortages, and (3) transportation planning for the seventies. The mass transportation systems of Detroit are discussed. F.O.S.

N76-23071# Department of Transportation, Washington, D.C. Office of the Assistant Secretary for Systems Development and Technology.
TECHNOLOGY ASSESSMENTS IN THE US DEPARTMENT OF TRANSPORTATION, 1975 Final Report
Nov. 1975 61 p refs
(PB-247697/6; DOT-TST-76-39) Avail: NTIS HC $4.50 CSCL 13B

Major ongoing or completed technology assessments are covered in the summary, which is divided into seven areas: (1) General or multimodal assessments; (2) Highway system assessments; (3) Air system assessments; (4) Rail system assessments; (5) Urban assessments; (6) Energy assessments, and (7) Environmental assessments. GRA

N76-23072# Cornell Univ., Ithaca, N.Y.
SUMMER INSTITUTE ON SCIENCE, TECHNOLOGY AND DEVELOPMENT, 14 JULY - 9 AUG. 1975 Final Report
Aug. 1975 50 p refs
(Contract AID/CSD-3158)
(PB-248714/8) Avail: NTIS HC $4.00 CSCL 05A

The study program was designed to: explore how developing nations might effectively use science and technology in the pursuit of their national goals; to provide participants with access to Cornell University expertise in key subject areas such as agricultural economics, regional planning, and industrial development; to stimulate participants to refresh and update their knowledge on S/TP; and to provide the Cornell community an opportunity to meet with S/TP practitioners from the field, to learn from their experiences; and develop; through the participants, a network of continuing international communication and collaborative S/TP research. GRA

N76-23073# Cornell Univ., Ithaca, N.Y.
PROGRAM ON POLICIES FOR SCIENCE AND TECHNOLOGY IN DEVELOPING NATIONS Annual Report, 1974 - 1975
1975 80 p refs
(Contract AID/CSD-3158)
(PB-248715/5) Avail: NTIS HC $5.00 CSCL 05A

Developing countries are increasingly concerned that the domestic impact of science and technology utilization be consistent with national development objectives--particularly employment generation and industrial and agricultural production. This concern has created a need for information on the establishment and implementation of effective policies for research, development, external acquisition, and utilization of science and technology in developing nations. GRA

88 SPACE SCIENCES (GENERAL)

N76-23074*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO-SOYUZ TEST PROJECT: PRELIMINARY SCIENCE REPORT
Feb. 1976 481 p refs Original contains color illustrations
(NASA-TM-X-58173; JSC-10632) Avail: NTIS HC $12.50; SOD CSCL 22A

Reported studies include space science experiments, life science experiments, materials science experiments and space manufacturing technologies. For individual titles, see N76-23075 through N76-23105.

N76-23075* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUMMARY OF SCIENTIFIC RESULTS
R. T. Giuli *In its* Apollo-Soyuz Test Project Feb. 1976 4 p
(For availability see N76-23074 13-88)
CSCL 22A

Conceptual, instrumental, and operational aspects of the experiments package are outlined. A preliminary assessment is given on scientific results in astronomy, earth atmosphere, earth observations, biological materials processing, and solid materials processing. G.G.

N76-23076* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MISSION DESCRIPTION
S. N. Hardee *In its* Apollo-Soyuz Test Project Feb. 1976 17 p (For availability see N76-23074 13-88)
CSCL 22A

The Apollo Soyuz mission was the first manned space flight conducted jointly by two nations. The United States and the U.S.S.R. achieved a substantial degree of success in: (1) obtaining flight experience for rendezvous and docking of manned spacecraft and developing a docking system that would be suitable for use as a standard international system, (2) demonstrating in-flight intervehicular crew transfer, and (3) conducting a series of science and applications experiments. The Apollo and Soyuz spacecraft, with minor exceptions, were similar to those flown on previous missions, but a new Apollo module, the docking module, was built specifically for this mission. The mission started with the Soyuz launch on July 15, 1975, followed by the Apollo launch on the same day. Docking of the two spacecraft occurred on July 17, and joint operations were conducted for 2 days. Both spacecraft landed safely and on schedule; the Soyuz landing in the U.S.S.R. occurred on July 21, and the Apollo landing near Hawaii occurred on July 24. Twenty-eight science experiments were performed during the mission. Author

N76-23077* Naval Research Lab., Washington, D.C.
SOFT X-RAY OBSERVATION EXPERIMENT MA-048 **c93**
S. Shulman, G. Fritz, D. Yentis, R. G. Cruddace, H. Friedman, W. Snyder (Johns Hopkins Univ.), and R. C. Henry (Johns Hopkins Univ.) *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 11 p (For availability see N76-23074 13-88)
CSCL 03B

The Apollo Soyuz Test Project Soft X-ray Experiment was designed to observe celestial X-ray sources in the energy range from 0.1 to 10 kiloelectronvolts. The instrument that was used in the experiment obtained energy and fast timing data to characterize both the spectrum and the variability of known X-ray sources. Data were obtained on approximately 12 sources. During the mission, the instrument developed an intermittent high voltage discharge problem that resulted in the loss of approximately 75 percent of the anticipated data, including the scans intended for mapping of the low energy diffuse X-ray background. Author

N76-23078* California Univ., Berkeley.
EXTREME ULTRAVIOLET SURVEY EXPERIMENT MA-083 **c93**
S. Bowyer, B. Margon, M. Lampton, F. Paresce, and R. Stern *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p refs (For availability see N76-23074 13-88)
CSCL 03B

A grazing incidence telescope sensitive to radiation in the 5- to 100-nanometer band was flown in the Apollo service module. On 10 nighttime revolutions, the command and service module was maneuvered to point the instrument at 30 different stellar targets for periods of 1 to 20 minutes, thus constituting the first sensitive search for extreme ultraviolet radiation from nonsolar sources. Several hours of supplementary data were also obtained during nighttime orbits when other experiments in the scientific instrument module bay were operating. Preliminary analysis of a small fraction of the total data indicates the definite detection of a strong source of extreme ultraviolet radiation during observations made during revolution 109. The source is located in Coma Berencies. The suggested optical identification is the white dwarf HZ 43. If this association is correct, the star has the highest temperature of any known white dwarf. Regardless of the optical identification, however, this object is the first nonsolar source to be detected in the extreme ultraviolet band. Author

N76-23079* California Univ., Berkeley.
INTERSTELLAR HELIUM FLOW EXPERIMENT MA-088 **c93**
S. Bowyer, J. Freeman, F. Paresce, M. Lampton, and B. Margon *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 15 p refs (For availability see N76-23074 13-88)
CSCL 03B

The Apollo Soyuz Test Project Interstellar Helium Glow Experiment (MA-088) studied the motion of helium in the local interstellar medium as that medium passed through the solar system to determine several poorly known properties of the local interstellar gas. The instrument used was a photometer sensitive to two solar extreme ultraviolet spectral lines that are resonantly scattered by helium gas. The instrument surveyed the entire celestial sphere during a series of slow, rolling maneuvers by the Apollo spacecraft. The equipment operated properly, and usable data were obtained. Author

N76-23080* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ARTIFICIAL SOLAR ECLIPSE EXPERIMENT MA-148 **c92**
R. T. Giuli, M. D. Jenness, A. N. Lunde, and K. A. Young *In its* Apollo-Soyuz Test Project Feb. 1976 5 p (For availability see N76-23074 13-88)
CSCL 03B

On July 19, 1975, the Apollo spacecraft successfully occulted the solar disk from the field of view of a camera mounted in the Soyuz spacecraft while performing a spacecraft separation maneuver to permit the outer solar corona to be viewable by the Soyuz camera. The camera operated automatically, and 55 frames were developed for scientific analysis. Author

N76-23081* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRYSTAL ACTIVATION EXPERIMENT MA-151 **c93**
J. I. Trombka, E. L. Eller, R. L. Schmadebeck, C. S. Dyer (Md. Univ.), R. C. Reedy (LASL), D. W. Barr (LASL), J. S. Gilmore (LASL), R. J. Prestwood (LASL), B. P. Bayhurst (LASL), D. G. Perry (LASL) et al *In its* Apollo-Soyuz Test Project Feb. 1976 10 p refs (For availability see N76-23074 13-88)
CSCL 03B

The crystal activation experiment consisted of two sample packages that were flown in the command module and returned to earth for analysis of the radioactivity induced in them during the flight. The objective of the experiment was to define the background caused by detector activation that interferes when gamma radiation is measured in the 0.02- to 10-megaelectronvolt range from earth orbit. Preliminary results show that the activation of the NaI(Tl) crystal was a factor of 3 below that from a similar measurement on Apollo 17. The identification of certain species and the level of activation observed show an important contribution from the interactions of thermal and energetic neutrons produced as secondaries in the spacecraft. That the activation was reduced by only a factor of 3 compared with the Apollo 17 experiment, despite the geomagnetically shielded orbit, possibly indicates more efficient secondary neutron production by the more energetic cosmic rays. Author

N76-23082* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ULTRAVIOLET ABSORPTION EXPERIMENT MA-059 **c90**
T. M. Donahue (Mich. Univ.), R. D. Hudson, J. Anderson (Mich. Univ.), F. Kaufman (Pittsburgh Univ.), and M. B. McElroy (Harvard Univ.) *In its* Apollo-Soyuz Test Project Feb. 1976 22 p refs (For availability see N76-23074 13-88)
CSCL 17E

The ultraviolet absorption experiment performed during the Apollo Soyuz mission involved sending a beam of atomic oxygen and atomic nitrogen resonance radiation, strong unabsorbable oxygen and nitrogen radiation, and visual radiation, all filling the same 3 deg-wide field of view from the Apollo to the Soyuz. The radiation struck a retroreflector array on the Soyuz and was returned to a spectrometer onboard the Apollo. The density of atomic oxygen and atomic nitrogen between the two spacecraft was measured by observing the amount of resonance radiation absorbed when the line joining Apollo and Soyuz was perpendicular to their velocity with respect to the ambient atmosphere. Information concerning oxygen densities was also obtained by observation of resonantly fluorescent light. The absorption experiments for atomic oxygen and atomic nitrogen were successfully performed at a range of 500 meters, and abundant resonance fluorescence data were obtained. Author

N76-23083* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRATOSPHERIC AEROSOL MEASUREMENT EXPERIMENT MA-007 **c92**
T. J. Pepin (Wyoming Univ.) and M. P. McCormick *In its* Apollo-Soyuz Test Project Feb. 1976 8 p (For availability see N76-23074 13-88)
CSCL 03B

The Apollo Soyuz Test Project Stratospheric Aerosol Measurement Experiment was flown to demonstrate that direct solar occultation measurements by photometers and photographs can be used for defining stratospheric aerosol concentrations. Supporting ground truth data were provided by laser radar and balloon borne dustsonde. Initial results show a significant difference in aerosol concentrations between the Northern and Southern Hemispheres. Author

N76-23084* Smithsonian Institution, Washington, D.C. National Air and Space Museum.
EARTH OBSERVATIONS AND PHOTOGRAPHY EXPERIMENT MA-136 **c43**
Farouk El-Baz and D. A. Mitchell *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 64 p refs (For availability see N76-23074 13-88)
CSCL 08E

The primary objectives of the earth observations and photography experiment of the Apollo Soyuz Test Project were to photograph various terrestrial structures and to use the capabilities of man as a trained observer in visually studying earth features and phenomena. Man's special capabilities include the sensitivity of the eye to subtle color variations and the speed with which the eye/brain system can interpret what is seen and select targets for photography. Real time astronaut observations constitute a useful complement to orbital photographs and greatly aid in their interpretation. Targets for mapping and hand held photography were selected on the basis of their value to specialists in the earth sciences including geology, oceanography, desert study, hydrology, meteorology, and environmental science. Author

N76-23085* Smithsonian Astrophysical Observatory, Cambridge, Mass.
DOPPLER TRACKING EXPERIMENT MA-089 **c46**
G. C. Weiffenbach and M. D. Grossi *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 31 p refs (For availability see N76-23074 13-88)
CSCL 08E

The Doppler tracking experiment was designed to test the feasibility of improved mapping of earth gravity field anomalies by means of the low-low satellite-to-satellite tracking method. All prescribed data have been retrieved and are currently being reduced and analyzed. Baseline data taken while the docking module was still attached to the command and service module indicated that the equipment operated satisfactorily. The efficacy of the two frequency ionospheric correction method has been demonstrated, and preliminary reduction of a data sample has successfully removed extraneous signatures down to the 50-millihertz level, where the rotational motion of the docking module is revealed. Photographs of the docking module, taken shortly after jettison, show that its rotation was stable. Author

N76-23086* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEODYNAMICS EXPERIMENT MA-128 **c46**
F. O. Vonbun, W. D. Kahn, J. W. Bryan, P. E. Schmid, W. T. Wells (Washington Analytical Services Center, Inc.), and T. D. Conrad (Washington Analytical Services Center, Inc.) *In its* Apollo-Soyuz Test Project Feb. 1976 16 p refs (For availability see N76-23074 13-88)
CSCL 08E

The Apollo Soyuz Test Project Geodynamics Experiment was performed to assess the feasibility of tracking and recovering high frequency components of the earth gravity field by utilizing a synchronous orbiting tracking station such as Applications Technology Satellite 6. Two prime areas of data collection were selected for this experiment. The first area is the center of the African continent, and the second area is the Indian Ocean depression centered at latitude 5 N and longitude 75 E. Preliminary results show that the detectability objective of the experiment has been achieved in both areas as well as in several additional anomalous areas around the globe. Gravity anomalies of the Karakoram and Himalayan mountain ranges of ocean trenches, and of the Diamantina depth are specific examples. Author

N76-23087* California Univ., Berkeley. Lawrence Berkeley Lab.
QUANTITATIVE OBSERVATION OF LIGHT FLASH SENSATIONS EXPERIMENT MA-106 **c52**
T. F. Budinger, C. A. Tobias, E. Schopper (Frankfurt Univ.), J. U. Schott (Frankfurt Univ.), R. H. Huesman, F. T. Upham, T. F. Wieskamp, J. M. Kucala, F. S. Goulding, D. A. Landis et al *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p refs (For availability see N76-23074 13-88)
CSCL 06P

Light flashes caused by the interaction of cosmic particles with the visual apparatus have been observed by astronauts on all space missions since Apollo 11. This Apollo Soyuz Test Project experiment compared measurements of the observer's visual sensitivity with measurements of the ambient radiation environment and with the frequency and character of the flashes observed. The data obtained reveal a latitude dependence of the frequency of observed flashes. This distribution of flashes is correlated with the distribution of cosmic particles with stopping power greater than 15 keV/ micrometers in the eye. The interaction of dark adaptation, specific ionization, and range of particles in the retina as factors in the visualization of particle passage is discussed. Author

N76-23088* Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).
BIOSTACK 3 EXPERIMENT MA-107 **c52**
H. Buecker, R. Facius, D. Hildebrand, G. Horneck, G. Reitz, U. Scheidemann, M. Schaefer, C. Thomas, B. Toth, A. R. Kranz et al *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 28 p refs (For availability see N76-23074 13-88)
CSCL 06R

The Biostack III experiment onboard the Apollo spacecraft during the Apollo Soyuz Test Project complemented the Biostack I and II experiments of the Apollo 16 and 17 missions. The objectives of these experiments were to study the biological effects of individual heavy cosmic particles of high energy loss (HZE) not available on earth, to study the influence of additional space flight factors, to obtain knowledge on the mechanism by which HZE particles damage biological materials, to get information on the spectrum of charge and energy of the cosmic ions in the spacecraft, and to estimate the radiation hazards to man in space. Author

N76-23089* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ZONE-FORMING FUNGI EXPERIMENT MA-147 **c51**
T. D. Rogers (Northrop Services, Inc., Houston, Tex.), G. R. Taylor, and M. E. Brower (Northrop Services, Inc., Houston, Tex.) *In its* Apollo-Soyuz Test Project Feb. 1976 12 p ref (For availability see N76-23074 13-88)
CSCL 06M

Streptomyces levoris was used as an experimental microorganism during the Apollo Soyuz Test Project to study specific biological considerations that may be influenced by space flight factors. Preflight, inflight, and postflight growth rates of the cultures were compared by photographing the specimens at regular intervals. Preliminary results based on visual comparison of the photographic data indicate that an increased growth rate occurred during space flight in two of eight flight specimens. The increased growth rate continued in the two specimens during the postflight period until termination of the experiment. Radiation effects may be responsible for the absence of spores in two areas of the last spore ring that was formed during the inflight period in one of the flight cultures; however, the radiation studies related to this experiment have not been completed. Distinct morphological differences in spore rings were observed when postflight spore rings were compared with inflight spore rings. Factors that are related to space flight recovery and reentry into earth gravity may have effected these alterations. Author

N76-23090* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

MICROBIAL EXCHANGE EXPERIMENT AR-002 c51

G. R. Taylor, K. D. Kropp (Northrop Serv. Inc., Houston, Tex.), M. R. Henney (Northrop Serv. Inc., Houston, Tex.), S. S. Ekblad (Northrop Serv. Inc., Houston, Tex.), T. O. Groves (Northrop Serv. Inc., Houston, Tex.), T. C. Molina (Northrop Serv. Inc., Houston, Tex.), J. G. Decelle (Northrop Serv. Inc., Houston, Tex.), C. F. Carmichael (Northrop Serv. Inc., Houston, Tex.), N. J. Gehring (Northrop Serv. Inc., Houston, Tex.), and E. L. Young (Northrop Serv. Inc., Houston, Tex.) *In its* Apollo-Soyuz Test Project Feb. 1976 31 p refs (For availability see N76-23074 13-88)

CSCL 06M

Operational aspects associated with the experiment and the activities of medically important microorganisms recovered from the Apollo crewmen are evaluated. A variety of potential pathogens was recovered from each of the prime and backup crew members before and after flight. However, no disease events were reported. Candida albicans and Staphylococcus aureus were shown to be transferred from one crewmember to another during the flight. No other medically significant changes in the microbial population were observed. Author

N76-23091* Baylor Univ., Houston, Tex.

CELLULAR IMMUNE RESPONSE EXPERIMENT MA-031 c52

B. S. Criswell *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 7 p refs (For availability see N76-23074 13-88)

CSCL 06P

Significant changes in phytohemagglutinin (PHA) lymphocytic responsiveness occurred in the cellular immune response of three astronauts during the 9 day flight of the Apollo Soyuz Test Project. Parameters studied were white blood cell concentrations, lymphocyte numbers, B- and T-lymphocyte distributions in peripheral blood, and lymphocyte responsiveness to PHA, pokeweed mitogen, Concanavalin A, and influenza virus antigen. Author

N76-23092* Baylor Univ., Houston, Tex.

THE EFFECTS OF SPACE FLIGHT ON POLYMORPHONUCLEAR LEUKOCYTE RESPONSE EXPERIMENT MA-032 c52

R. R. Martin *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 29 p refs (For availability see N76-23074 13-88)

CSCL 06P

In a series of studies performed at intervals from 30 day before flight to 30 days after recovery, blood samples were obtained from the three astronauts of the Apollo Soyuz Test Project and from eight control subjects. To determine the effects of space flight on polymorphonuclear leukocytes, tests were performed on blood samples obtained as quickly as possible after splashdown and on the day following recovery. The astronauts' inhalation of propellant gases and the inception of corticosteroid therapy 1 day after recovery provided an additional opportunity to investigate the possible effects of these factors on leukocyte function. Data were obtained during each time period on the total leukocyte count, differential count, leukocyte adhesion, leukocyte migration and chemotaxis, phagocytosis, and histochemical staining for leukocyte acid and alkaline phosphatase. These observations present a variety of in vitro correlates to white blood cell function within the body. Taken together, they serve as a reasonable approximation of the effects of space flight on leukocyte function. Author

N76-23093* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

KILLIFISH HATCHING AND ORIENTATION EXPERIMENT MA-161 c51

H. W. Scheld (Baylor Univ., Houston, Tex.), J. F. Boyd (Northrop Serv. Inc., Houston, Tex.), G. A. Bozarth (Northrop Serv. Inc., Houston, Tex.), J. A. Conner (Rice Univ.), V. B. Eichler (Wichita State Univ.), P. M. Fuller (Louisville Univ.), R. B. Hoffman, J. R. Keefe (Texas A and M Univ., College Station), K. P. Kuchnow (Bryn Mawr Coll.), and J. M. Oppenheimer (Mainz Univ.) *In its* Apollo-Soyuz Test Project Feb. 1976 14 p refs (For availability see N76-23074 13-88)

CSCL 06C

The killfish Fundulus heteroclitus was used as a model system for study of embryonic development and vestibular adaptation in orbital flight. Juvenile fish in a zero gravity environment exhibited looping swimming activity similar to that observed during the Skylab 3 mission. Hatchings from a 336 hour egg stage were also observed to loop. At splashdown, both juveniles and hatchings exhibited a typical diving response suggesting relatively normal vestibular function. Juveniles exhibited swimming patterns suggestive of abnormal swim bladders. The embryos exhibited no abnormalities resulting from development in a zero gravity environment. Author

N76-23094* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ELECTROPHORESIS TECHNOLOGY EXPERIMENT MA-011 c51

R. E. Allen, G. H. Barlow (Abbott Lab., Chicago, Ill.), M. Bier (Veterans Admin. Hospital, Tucson, Ari.), P. E. Bigazzi (State Univ. of New York, Buffalo), R. J. Knox (Oregon Univ., Portland), F. J. Micale (Lehigh Univ.), G. V. F. Seaman (Oregon Univ., Portland), J. W. Vanderhoff (Lehigh Univ.), C. J. VanOss (State Univ. of New York, Buffalo), W. J. Patterson et al *In* Apollo-Soyuz Test Project Feb. 1976 23 p refs (For availability see N76-23074 13-88)

CSCL 06F

Experiment MA-011, electrophoresis technology, was designed to test electrophoresis hardware that would continue the development of technology for electrophoretic separation of materials in the near zero g environment of space. The experimental hardware generally functioned as planned. Frozen live cells were successfully transported into space, electrophoretic processing was performed, and viable cells were returned to earth. A separation of the three types of fixed red blood cells (rabbit, human, and horse) was demonstrated. The human lymphocytes, however, showed no apparent migration. The separation of human kidney cells produced the most exciting data. Analysis shows electrophoretic separation throughout the entire column with at least four bands of viable cells. The isotachophoresis experiment definitely demonstrated the isotachophoretic separation of biological cells in a near zero g environment. Author

N76-23095* Max-Planck-Institut fuer Biochemie, Martinsried bei Muenchen (West Germany).

ELECTROPHORESIS EXPERIMENT, EXPERIMENT MA-014 c51

K. Hannig and H. Wirth *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p ref (For availability see N76-23074 13-88)

CSCL 06F

A continuous, free flow electrophoresis study was conducted during the Apollo Soyuz Test Project mission to investigate and evaluate the increase in sample flow rate and sample resolution achievable in space. The electrophoresis equipment was designed for the separation of four mixtures of biological cells with variable sample flow rates, buffer flow rates, and electric field gradients. Separation quality was assessed by measuring the light from a quartz lamp through the electrophoresis channel and on to a photodiode system. The preliminary results indicate that all monitored systems operated correctly during the experiment. The optical system produced a light that was too bright to discern true cell distributions, but data were received that show a distribution of separated cells. Author

N76-23096* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

MULTIPURPOSE ELECTRIC FURNACE EXPERIMENT MA-010 c09

A. Boese, J. McHugh (Westinghouse Res. Lab.), and R. Seidensticker (Westinghouse Res. Lab.) *In its* Apollo-Soyuz Test Project Feb. 1976 9 p (For availability see N76-23074 13-88)

CSCL 14B

Experiments on solidification, crystal growth, and other processes involving phase changes in various type materials were performed in the multipurpose electric furnace developed for the Apollo Soyuz Test Project. Phase changes were conducted at elevated temperatures (as high as 1150 C) in systems comprising

selected combinations of solid, liquid, and vapor phases. Because of the near zero g environment aboard the spacecraft, the liquid and vapor phases were essentially quiescent, and phases of different density had little or no tendency to separate. Author

N76-23097* Oak Ridge National Lab., Tenn.
SURFACE-TENSION-INDUCED CONVECTION EXPERIMENT MA-041 **c34**
R. E. Reed *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 11 p ref (For availability see N76-23074 13-88)
CSCL 20D

In the absence of gravity, stirring in a liquid is suppressed because of density differences caused by thermal or compositional gradients. However, other mechanisms resulting in natural convection in a microgravity environment exist. One of the most important mechanisms for liquid metals is surface tension driven convection, which becomes predominant in the low gravity environment. In this case, surface tension differences caused by compositional or temperature gradients have been demonstrated to cause stirring in liquids during experiments performed onboard Skylab. Compositional gradients were created by adding a soap solution to a large water globule, which caused vigorous fluid motion for some moments after the addition. Author

N76-23098* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MONOTECTIC AND SYNTECTIC ALLOYS EXPERIMENT MA-044 **c26**
C. Y. Ang and L. L. Lacy *In its* Apollo-Soyuz Test Project Feb. 1976 25 p refs (For availability see N76-23074 13-88)
CSCL 11F

The flight test furnace run of the monotectic and syntectic alloys experiment was successfully performed during the Apollo Soyuz Test Project mission. All three experiment cartridges were returned intact. A second ground based test was conducted after the mission to provide one g samples with an equivalent thermal history. The examinations of all flight and ground based cartridges and ampoules have been completed. Encouraging results have been obtained in the preliminary analysis of one flight aluminum antimonide sample as compared to ground based and prototype test counterparts. In terms of reduction of the unwanted second phase, the low g sample shows a homogeneity improvement by a factor of 5 to 20. Preliminary examination of one lead zinc flight sample shows a dispersion of lead in the zinc matrix. However, complete homogenization of the material did not occur. A thermal analysis of flight data shows that the average soak temperature for the head zinc ampoules was 20 C lower than planned but 35 C above the published consolute temperature.. Author

N76-23099* Massachusetts Inst. of Tech., Cambridge.
INTERFACE MARKINGS IN CRYSTALS EXPERIMENT MA-060 **c76**
H. C. Gatos and A. F. Witt *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 8 p (For availability see N76-23074 13-88)
CSCL 20B

Doped germanium single crystals with interface demarcation were successfully grown during the Apollo Soyuz Test Project mission. Interface demarcation permitted the determination of the microscopic growth behavior from the onset to the termination of solidification. Preliminary segregation analysis shows striking differences in segregation in the presence of gravity. The correlation between microscopic growth rate behavior and the composition of the solid on the microscale is being evaluated. Author

N76-23100* Grumman Aerospace Corp., Bethpage, N.Y.
ZERO-G PROCESSING OF MAGNETS EXPERIMENT MA-070 **c12**
D. J. Larson, Jr. *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 13 p refs (For availability see N76-23074 13-88)
CSCL 20C

Solidification of magnetic materials in the low gravity orbital environment was studied. The magnetic compounds under study, manganese bismuth and copper cobalt cerium ((Cu, Co)5Ce), both have the potential for the development of high coercive strength. Preliminary results indicate that static fluid configurations, in the absence of the gravitational body force, differ substantially from the documented terrestrial behavior. Chemical homogeneity is substantially enhanced on a macroscopic and microscopic level. Single crystal matrices have been grown in the coordinated growth regions of the flight samples. Primary crystals one order of magnitude greater than those grown terrestrially have been noted and are limited in size by the ampoule dimensions. Author

N76-23101* Rensselaer Polytechnic Inst., Troy, N.Y.
CRYSTAL GROWTH FROM THE VAPOR PHASE EXPERIMENT MA-085 **c76**
H. Wiedemeir, H. Sadeek, F. C. Klaessig, and M. Norek *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 20 p refs (For availability see N76-23074 13-88)
CSCL 20B

Three vapor transport experiments on multicomponent systems were performed during the Apollo Soyuz mission to determine the effects of microgravity forces on crystal morphology and mass transport rates. The mixed systems used germanium selenide, tellurium, germanium tetraiodide (transport agent), germanium monosulfide, germanium tetrachloride (transport agent), and argon (inert atmosphere). The materials were enclosed in evacuated sealed ampoules of fused silica and were transported in a temperature gradient of the multipurpose electric furnace onboard the Apollo Soyuz spacecraft. Preliminary evaluation of 2 systems shows improved quality of space grown crystals in terms of growth morphology and bulk perfection. This conclusion is based on a direct comparison of space grown and ground based crystals by means of X-ray diffraction, microscopic, and chemical etching techniques. The observation of greater mass transport rates than predicted for a microgravity environment by existing vapor transport models indicates the existence of nongravity caused transport effects in a reactive solid/gas phase system. Author

N76-23102* California Univ., Los Angeles.
HALIDE EUTECTIC GROWTH EXPERIMENT MA-131 **c24**
A. S. Yue, B. K. Yue, and J. Y. M. Lee *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 8 p refs (For availability see N76-23074 13-88)
CSCL 11D

Fiberlike sodium chloride/lithium fluoride eutectic mixtures have been produced on earth and in space by the directional solidification technique. Macroscopic and microscopic examinations were made on longitudinal and transverse sections of Apollo Soyuz Test Project space grown and earth grown ingots. It was found that samples grown in space have a higher percentage of fibers alined with the growth axis. The enhanced alinement of fibers is attributed to the absence of convection currents in the liquid during solidification. Optical transmittance measurements of transverse sections of the space grown and earth grown ingots were performed with an infrared spectrometer. For a given sample thickness, the highest transmittance was obtained from ingots grown in space. For samples of different thicknesses, grown either in space or on earth, it was found that the thinner the sample, the higher the transmittance. This is in agreement with the general optical property of transparent materials. Author

N76-23103* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTIPLE MATERIAL MELTING EXPERIMENT MA-150 **c26**
R. S. Snyder and A. Boese *In its* Apollo-Soyuz Test Project Feb. 1976 4 p ref (For availability see N76-23074 13-88)
CSCL 11F

Three different experiments to reveal the effect of weightlessness on some metallurgical and crystalline processes in metals and semiconductors were prepared for the Apollo Soyuz Test Project mission. The experiement materials were fabricated in the U.S.S.R., assembled in three stainless steel cartridges of U.S. design, taken into space for processing in the multipurpose furnace, and returned to the U.S.S.R. for analysis. Analysis of the samples and comparison with the ground based test results are in progress. Author

N76-23104* Rockwell International Science Center, Thousand Oaks, Calif.
CRYSTAL GROWTH EXPERIMENT MA-028 **c76**
M. D. Lind *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 9 p refs (For availability see N76-23074 13-88)
Avail: NTIS CSCL 20B

The crystal growth experiment assessed a novel process for growing single crystals of insoluble substances by allowing two or more reactant solutions to diffuse toward each other through a region of pure solvent in zero g. The experiment was entirely successful and yielded crystals of about the expected size, quality, and number. Photographs were taken in orbit to record the progress of the crystal growth. Author

N76-23105* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SCIENCE DEMONSTRATIONS **c34**
R. S. Snyder, K. S. Clifton, B. Facemire, A. F. Whitaker, P. G. Grodska (Lockheed Missiles and Space Co., Sunnyvale, Calif.), and S. Bourgeois (Lockheed Missiles and Space Co., Sunnyvale, Calif.) *In its* Apollo-Soyuz Test Project Feb. 1976 9 p refs (For availability see N76-23074 13-88)
CSCL 20D

Three demonstrations of scientific concepts concerning liquids were performed during the Apollo-Soyuz Test Project mission. Chemical foaming, spreading of liquids, and capillary wicking were the subjects of each demonstration photographed in space. The results clearly illustrated the basic principles, and films suitable for educational uses are now available from the first author. Author

N76-23106# Royal Greenwich Observatory, Herstmonceux (England). Time and Latitude Service.
GREENWICH TIME REPORT, JANUARY - MARCH 1975
Mar. 1975 19 p
Avail: NTIS HC $3.50

Greenwich time and latitude observations for January through March 1975 are presented. Radio time signals and standard frequency emissions are included. ESA

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N76-23107*# California Univ., Berkeley.
OPTICAL PULSATIONS IN HZ HERCULIS. 5. PULSE-RESOLVED SPECTROPHOTOMETRY
Bruce Margon, Arthur Davidsen (Johns Hopkins Univ.), and Stuart Bowyer 19 Mar. 1976 16 p refs
(Grant NsG-7139)
(NASA-CR-147107) Avail: NTIS HC $3.50 CSCL 03A

Digital spectra of HZ Herculis were obtained with 10 A resolution in the 3,600 - 6,000 A region, synchronously dividing the 1.24-s optical pulsation period into eight 155-ms phase bins. The optical pulses are detected in the data, but their fractional amplitude is only 0.08 percent, a factor of 4 less than typically observed. The separate spectra of each one-eighth of the pulse are identical to within the statistics of the observation. If the X-ray to optical pulse reprocessing mechanism concentrates the optical pulsations into discrete spectral line features, data require the pulses to be distributed among more than four such lines. Author

N76-23108*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL VARIABILITY IN THE X-RAY PULSAR GX 1+4
R. H. Becker, E. A. Boldt, S. S. Holt, S. H. Pravdo, R. E. Rothschild, P. J. Serlemitsos, and J. H. Swank Mar. 1976 12 p refs Prepared in cooperation with Maryland Univ., College Park Submitted for publication
(Grant NGR-21-022-316)
(NASA-TM-X-71100; X-661-76-66) Avail: NTIS HC $3.50 CSCL 03A

Observations of the galactic center region, hard X-ray source GX 1+4 by the GSFC X-ray spectroscopy experiment on OSO-8 confirm that GX 1+4 is a slow X-ray pulsar. The amount of absorption by cold matter in the spectrum of GX 1+4 varies significantly within a 24 hour period, behavior typical of many X-ray binary systems. The light curve for the pulsations from GX 1+4 appears to be energy dependent. Author

N76-23109# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ANALYSIS OF BROAD-BAND PHOTOMETRY OF THE LONG-PERIOD VARIABLES
Cecilia Payne-Gaposchkin and Charles A. Whitney 25 Mar. 1976 53 p refs
(SAO-Special-Rept-370) Avail: NTIS HC $4.50

The variations of color with phase were studied for 166 Mira stars (spectrum M, S, and C) for which infrared observations and simultaneous visual estimates are available. The variations of color with phase, and of infrared magnitude with phase, were related to maximal spectrum and to period. A recalibration of the relation between effective temperature and the water-cell index of Pettit and Nicholson led to a radius variation that differs significantly from the one that they obtained. A relation between infrared color and surface brightness for nonvariable giant stars was derived; supergiants and Mira Ceti deviate from this relation, even when allowance is made for the dependence of radius on wavelength. It was concluded that the photometric determination of radius variations is unreliable, and the scale of effective temperatures highly uncertain. Author

N76-23110*# National Aeronautics and Space Administration, Washington, D.C.
THE SPACE TELESCOPE
1976 240 p refs Presented at 21st Ann. Meeting of Am. Astronautical Soc., Denver, 26-28 Aug. 1975
(NASA-SP-392) Avail: NTIS MF $2.25; SOD HC $2.30 CSCL 03A

Papers concerning the development of the Space Telescope which were presented at the Twenty-first Annual Meeting of the American Astronautical Society in August, 1975 are included. Mission planning, telescope performance, optical detectors, mirror construction, pointing and control systems, data management, and maintenance of the telescope are discussed. D.M.L.

N76-23111# Cambridge Univ. (England). Inst. of Astronomy.
[RESEARCH ACTIVITIES OF THE INSTITUTE OF ASTRONOMY] Annual Report, period ending 31 Aug. 1975
1975 21 p refs
Avail: NTIS HC $3.50

Observations on galaxies and relevant cosmological topics are discussed and studies on stars and accretion of compact X-ray sources detailed. Progress on instrumentation design studies is also reported. ESA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N76-23112 Texas Univ., Austin.
RESONANT GRAVITATIONAL SYSTEMS: THE LONG-TERM MOTION OF PLUTO AND OF A SYNCHRONOUS SATELLITE Ph.D. Thesis
Roger Earl Diehl 1975 177 p
Avail: Univ. Microfilms Order No. 76-8018

A semi-analytical solution for long-term motion of Pluto is presented. The solution was obtained using a modified von Zeipel procedure. A previous semi-analytical solution for Pluto is corrected and extended by introducing an improved dynamical model. The model is a modified circular restricted problem of three bodies consisting of an oblate sun and Neptune as primaries with Pluto having negligible mass. The solution includes both the Pluto-Neptune and Pluto-Uranus resonant effects, as well as the nonresonant effects due to Jupiter and Saturn. Librational amplitudes and periods for the eccentricity, inclination and the argument of the peri-helion of Pluto were calculated from the semi-analytical theory. It is shown that the librational amplitudes

of the elements of Pluto are well within the maximum allowable librational amplitudes for solutions calculated from the semi-analytical theory with a three-to-two commensurability. Longterm, semi-analytical solutions are presented for the eccentricity, inclination and the argument of perigee for a synchronous satellite. Dissert Abstr.

N76-23113 Arizona Univ., Tucson.
TOPICS IN WHITE DWARF ASTROPHYSICS Ph.D. Thesis
Paul Michael Norman Hintzen 1975 79 p
Avail: Univ. Microfilms Order No. 76-8665

The apparent deficiency, compared to theoretical predictions, of cool degenerate stars was investigated. A spectroscopic study resulted in the discovery of two dozen red degenerates, doubling the number of known degenerates redder than B-V = 0.4. About 27% of the candidates were identified as white dwarfs. For luminosities near the main sequence, the proper motions and magnitudes of the apparent nondegenerates in the sample implied unreasonably large space motions. Because it was suspected that red degenerates were being incorrectly classified as subdwarfs, atmospheric models were computed for white dwarfs at the temperatures under investigation. Line profiles obtained from these models indicate that degenerate stars with T sub e approximately equal to 6000 K and depleted surface metals would be extremely difficult to identify spectroscopically. Their hydrogen and calcium line profiles would strongly resemble those of classical subdwarfs. These results indicate that the existence of the postulated deficiency of red degenerate stars is uncertain. Dissert. Abstr.

N76-23114*# TRW Systems Group, Redondo Beach, Calif. Space Sciences Dept.
PRELIMINARY INVESTIGATION OF INTERPLANETARY SHOCK STRUCTURE: QUASI-PARALLEL SHOCKS Final Report
E. W. Greenstadt 30 Nov. 1974 32 p refs
(Contract NASw-2542)
(NASA-CR-147207; TRW-24034-6001-RU-00) Avail: NTIS HC $4.00 CSCL 03B

Pioneer 9's magnetic field and plasma data were studied to develop arguments for or against the observation of oblique interplanetary shocks. Structural classifications are defined, and the justification for seeking these classifications in the solar wind are presented. F.O.S.

N76-23115*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
SEARCHES FOR EXTRATERRESTRIAL CIVILIZATIONS
V. S. Troitskiy Washington NASA Apr. 1976 16 p Transl. into ENGLISH from Poiski Vnezemnykh Tsivilizatsiy (Moscow), issue 7, 1974 p 127-138
(Contract NASw-2789)
(NASA-TT-F-16990) Avail: NTIS HC $3.50 CSCL 03B

A civilization is defined as an intelligent society capable of revealing itself using means detectable at interstellar distances. Civilizations are classified according to energy consumption: (1) planetary (e.g. earth's) (2) entire star, and (3) galactic. Although it is not known whether stars other than our sun have planetary systems, theoretical hypotheses on the possibility of intelligent life existing elsewhere are presented. Early attempts at detecting electromagnetic emissions from outer space have revealed emissions from pulsars, space masers, and space clouds. The most promising approach is the detection of infrared radiation at wavelengths of 3-60 cm. However no phenomena have yet been discovered that could not be explained by natural processes. Author

N76-23116*# California Univ., Berkeley. Space Sciences Lab.
AETHER DRIFT AND THE ISOTROPY OF THE UNIVERSE Semiannual Progress Report, 1 Oct. 1975 - 31 Mar. 1975
Richard A. Muller 15 Apr. 1976 31 p refs
(Grant NSG-2125)
(NASA-CR-147143; SSL-Ser-17-Issue-25) Avail: NTIS HC $4.00 CSCL 03B

An experiment is proposed which will detect and map the large-angular-scale anisotropies in the 3 deg K primordial black-body radiation with a sensitivity of .0002 deg K and an angular resolution of about 10 deg . It will detect the motion of the earth with respect to the distant matter of the Universe ('Aether Drift'), and will probe the homogeneity and isotropy of the Universe (the 'Cosmological Principle'). The experiment will use two Dicke radiometers, one at 33 GHz to detect the cosmic anisotropy, and one at 54 GHz to detect anisotropies in the residual oxygen above the detectors. An upper hatch for the NASA-AMES Earth Survey Aircraft (U-2) is being modified to accept the dual-radiometer system. A few hours of observation should be sufficient to detect an anisotropy. Author

N76-23117*# Dudley Observatory, Albany, N.Y.
ICE IN SPACE: AN EXPERIMENTAL AND THEORETICAL INVESTIGATION Interim Report
Harvey Patashnick and George Rupprecht 8 Mar. 1976 156 p refs
(Contract NAS8-30566)
(NASA-CR-144273) Avail: NTIS HC $6.75 CSCL 03B

The thermodynamics of water ice formation was experimentally investigated under a wide variety of conditions, including those of outer space. This information, and in particular, the lifetime of ice particles as a function of solar distance is an absolute requirement for proper interpretation of photometric profiles of comets. The sublimation of ice particles in a nonequilibrium situation was studied. An oscillating fiber microbalance was used to measure the sublimation rate of water droplets (which were suspended on a long quartz fiber which was oscillating in a vacuum chamber). The influence of particle size, surface temperature, and the index refraction from simulated solar radiation were studied in relation to ice formation. Also examined was the influence of impurities (clathrates) on ice formation. Windows in the vacuum chamber allowed the ice particles to be exposed to a 1 kilowatt xenon arc lamp which was used to simulate solar radiation. Ice is proposed as a possible energy source for comets, as amorphous water ice and ammonia in low temperature and pressure environments demonstrated a clear energy release upon warming. Motion pictures of ice formation were taken and photographs are shown. J.R.T.

N76-23118*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
OBSERVATION OF BOW SHOCK PROTONS AT THE LUNAR ORBIT M.S. Thesis
John L. Benson Apr. 1974 248 p refs
(Contract NAS9-5911)
(NASA-CR-147653) Avail: NTIS HC $8.00 CSCL 03B

Protons with energies ranging from about 500 eV to 3,500 eV were observed by the Suprathermal Ion Detector Experiment (SIDE) on both the dusk and dawn sides of the magnetosphere. On each lunation these particles appeared as a rather continuous phenomenon for 3 to 5 days after crossing from the dawn-side magnetosheath into the solar wind and for about 2 days prior to entering the dusk-side magnetosheath. Data from the SIDE and from the Explorer 35 lunar orbiting magnetometer were analyzed and these data indicated that the transverse ion flows observed by the SIDE in the pre and post bow shock crossing regions of the lunar orbit are due to these deviated solar wind particles. A computer model based on drift trajectories for particles leaving the shock was developed and synthetic particle data produced by this model are in good agreement with the observed data. Author

N76-23082* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ULTRAVIOLET ABSORPTION EXPERIMENT MA-059
T. M. Donahue (Mich. Univ.), R. D. Hudson, J. Anderson (Mich. Univ.), F. Kaufman (Pittsburgh Univ.), and M. B. McElroy (Harvard Univ.) *In its* Apollo-Soyuz Test Project Feb. 1976 22 p refs
(For availability see N76-23074 13-88)
CSCL 17E

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N76-23119 Arizona State Univ., Tempe.
THE ANALYSIS OF LOW MOLECULAR WEIGHT ORGANIC COMPOUNDS IN CARBONACEOUS METEORITES Ph.D. Thesis
Gregory Alan Jungclaus 1975 222 p
Avail: Univ. Microfilms Order No. 76-9159

Analytical procedures, including methods adopted from the recent chemical literature and new methods developed for this study, were applied to the further characterization of the extractable organic compounds in the Murchison, Murray and Allende carbonaceous meteorites. The instrumental techniques used included colorimetry, gas chromatography and gas chromatography/mass spectrometry. The extracts were found to contain compounds from the alcohol, aldehyde, ketone and amine functional groups. Some progress was made in identifying and quantifying individual compounds as well as classes of organic compounds. Water was found to be as efficient a solvent for extraction as dilute acid even for the basic amines. Also, extraction with water in a sealed tube was found to retain compounds apparently lost through volatization during extraction under reflux conditions. Dissert. Abstr.

N76-23120*# Planetary Science Inst., Tucson, Ariz.
INVESTIGATIONS OF MARTIAN HISTORY Final Report, Sep. 1975
William K. Hartmann Sep. 1976 16 p
(Contract NASw-2735)
(NASA-CR-146835) Avail: NTIS HC $3.50 CSCL 03B

Geologic and stratigraphic analyses of Martian channels were accomplished using Mariner frames of high resolution. Crater counts were made to determine which forms had the least relative age. Results indicate that major channel and chaotic systems were relatively young, and that Mars experienced periods of enhanced erosive activity during a period of early dense atmospheric activity with rain. The problem of absolute age determination is discussed and geomorphological studies of selected Local Martian Regions are presented. F.O.S.

N76-23121*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
REDUCTIONS OF OBSERVATIONS OF COMETS DURING THE 19TH CENTURY
E. D. Kondratyeva Washington NASA Apr. 1976 9 p refs Transl. into ENGLISH from Kaz. Gorodskaya Astron. Observ., Trudy (USSR), no. 37, 1970 p 141-145
(Contract NASw-2789)
(NASA-TT-F-16728) Avail: NTIS HC $3.50 CSCL 03B

The Temple-Tuttle comet was discovered on December 21, 1865. Calculations based on observations made in 1865 - 1866 were improved and programmed and run on a BESM-4 computer. By applying several procedures described in this article, a system of elements may be used for combining all occurrences of the Temple-Tuttle comet. Author

N76-23122*# Kanner (Leo) Associates, Redwood City, Calif.
DYNAMICS OF THE ATMOSPHERE OF VENUS
N. I. Burangulov, S. S. Zilitinkevich, ed., V. V. Kerzhanovich, A. S. Monin, ed., M. K. Rozhdestvenskiy, A. S. Safray, V. G. Turikov, and D. V. Chalikov Washington NASA Jan. 1976 195 p refs Transl. into ENGLISH of the book "Dinamika Atmosfery Venery" Leningrad, Nauka Press, 1975 184 p
(Contract NASw-2790)
(NASA-TT-F-16809) Avail: NTIS HC $7.50 CSCL 03B

Theoretical and experimental research on distribution of wind velocity by altitude and general atmospheric circulation of Venus is discussed. The experimental data used were obtained on the Venera-4--Venera-8 interplanetary space stations. These data are compared with those taken from numerical experiments on a mathematical model of the atmosphere of Venus. Similarities and differences between theoretical and experimental profiles of wind velocity are covered. Author

N76-23123*# Woods Hole Oceanographic Institution, Mass.
VOLCANOLOGY AND MORPHOLOGY Final Report
Wilfred B. Bryan 20 Mar. 1976 53 p refs
(Contract NAS9-12564)
(NASA-CR-147553) Avail: NTIS HC $4.50 CSCL 03B

Apollo 15 photographs of the southern parts of Serenitatis and Imbrium were used for a study of the morphology and distribution of wrinkle ridges. Volcanic and structural features along the south margin of Serenitatis were also studied, including the Dawes basalt cinder cones. Volcanic and structural features in crater Aitken were investigated as well. Study of crater Goclenius showed a close relationship between morphology of the impact crater and grabens which tend to parallel directions of the lunar grid. Similar trends were observed in the walls of crater Tsiolkovsky and other linear structures. Small craters of possible volcanic origin were also studied. Possible cinder cones were found associated with the Dawes basalt and in the floor of craters Aitken and Goclenius. Small pit craters were observed in the floors of these craters. Attempts were made to obtain contour maps of specific small features and to compare Orbiter and Apollo photographs to determine short term changes associated with other processes. D.M.L.

N76-23124*# California Univ., Los Angeles.
RELATIVISTIC ELECTRONS AND WHISTLERS IN JUPITER'S MAGNETOSPHERE
D. D. Barbosa and F. V. Coroniti Apr. 1976 34 p refs
(Grant NGL-05-007-190)
(NASA-CR-147104; PPG-260) Avail: NTIS HC $4.00 CSCL 03B

The path-integrated gain of parallel propagating whistlers driven unstable by an anisotropic distribution of relativistic electrons in the stable trapping region of Jupiter's inner magnetosphere was computed. The requirement that a gain of 3 e-foldings of power balance the power lost by imperfect reflection along the flux tube sets a stably-trapped flux of electrons which is close to the non-relativistic result. Comparison with measurements shows that observed fluxes are near the stably-trapped limit, which suggests that whistler wave intensities may be high enough to cause significant diffusion of electrons accounting for the observed reduction of phase space densities. A crude estimate of the wave intensity necessary to diffuse electrons on a radial diffusion time scale yields a lower limit for the magnetic field fluctuation intensity. Author

N76-23125*# Northwestern Univ., Evanston, Ill.
THE CORRALITOS OBSERVATORY PROGRAM FOR THE DETECTION OF LUNAR TRANSIENT PHENOMENA
J. Allen Hynek, J. R. Dunlap, and Elaine Marie Hendry Apr. 1976 27 p refs
(Grant NsG-497)
(NASA-CR-147888) Avail: NTIS HC $4.00 CSCL 03B

This is a final report on the establishment, observing procedures, and observational results of a survey program for the detection of lunar transient phenomena (LTP's) by electro-optical image conversion means. For survey, a unique detection system with an image orthicon was used as the primary element in conjunction with a 24-in. f/20 Cassegrainian telescope. Observations in three spectral ranges, with 6,466 man-hours of observing, were actually performed during the period from October 27, 1965, to April 26, 1972. Within this entire period, no color or feature change within the detection capabilities of the instrumentation was observed, either independently or in follow up of amateur LTP reports, with the exception of one general bluing and several localized bluings (probably ascribable to the effects of the terrestrial atmosphere) that were observed solely by the Corralitos system. A table is presented indicating amateur and professional reports of LTP's and the results of efforts to confirm these reports through the Corralitos system. Author

N76-23126*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
THE FIRST DISCOVERY OF TEKTITES IN THE USSR
P. V. Florenskiy Washington NASA Apr. 1976 7 p refs Transl. into ENGLISH from Piroda (USSR), no. 1, Jan. 1976 p 85-87

(Contract NASw-2789)
(NASA-TT-F-16729) Avail: NTIS HC $3.50 CSCL 03B

Solidified glass droplets, found in the Priaral area of the Zhamanshin region are considered tektites. The chemical composition of the pieces sharply differs from typical known earth formations, but are similar to the composition of tektites from other locations in the world. Minute crystals of plagioclases, magnetite and pyroxene, typical for impactites from meteorite craters in Nordlingen-Riss (GFR) and Popigay (Eastern Siberia) were found in the Zhamanshin region. The absolute age of the glass-type rocks in the Zhamanshin region is from 8 to 1 million years and less--of comparatively recent origin. Author

N76-23127*# Chicago Univ., Ill. Dept. of the Geophysical Sciences.
MINERALOGY OF THE IBITIRA EUCRITE AND COMPARISON WITH OTHER EUCRITES AND LUNAR SAMPLES
I. M. Steele and J. V. Smith [1975] 16 p refs
(Grants NGL-14-001-171; NSF DMR-72-03028-A04)
(NASA-CR-147108) Avail: NTIS HC $3.50 CSCL 03B

Single crystal X-ray and energy dispersive electron-probe techniques are used to study the mineralogy and track history of Ibitira. The mineralogical features of the Ibitire eucrite are described and examined in relation to data for other eucrites and howardites and lunar samples. The processes which transformed a presumed igneous texture into a more complex one are discussed. J.M.S.

N76-23128*# Arizona Univ., Tucson. Dept. of Planetary Sciences.
INTERIORS OF THE GIANT PLANETS Semiannual Report, 1 Oct. 1975 - 1 Apr. 1976
W. B. Hubbard 12 May 1976 12 p refs
(Grant NsG-7045)
(NASA-CR-146984; SAR-4) Avail: NTIS HC $3.50 CSCL 03B

Various investigations concerning Jupiter, Uranus and Saturn are discussed. Revisions in the Galilean satellite ephemerides led to a new interpretation of earth-based measurements of Jovian oblateness which agrees with Pioneer measurements. In the area of scintillation theory, a semi-qualitative result was obtained for spike profiles produced by finite stellar disks viewed through Kolmogorov turbulence. It was also possible to set limits on the systematic distortion of stellar occulation profiles by turbulence which minimize the systematic distortion problem. The position of Miranda was studied for the purpose of obtaining an accurate prediction of a possible stellar occultation by Miranda in 1977, following an occultation of the same star by Uranus. In addition, using thermodynamic calculations, a model was developed for the adiabatic cooling of Jovian-type planets and an observational test of the model was proposed. The dynamic structure of Saturn's rings was also studied. D.M.L.

N76-23129*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY MISSION SUMMARIES. VOLUME 1: INTRODUCTION AND OVERVIEW
Aug. 1974 17 p 13 Vol.
(Contract NAS7-100)
(NASA-CR-147093; JPL-SP-43-10-Vol-1) Avail: NTIS HC $3.50 CSCL 03B

Tabular synopses of twelve missions are presented along with the Mariner Jupiter/Saturn 1977 mission for comparison. Mission definitions considered include: Mars Polar Orbiter; Mars Surface Sample Return; Mars Rover; Marine Jupiter/Uranus 1979 with Uranus Entry Probe; Mariner Jupiter Orbiter; Mariner Mercury Orbiter 1978; Early Mariner Comet Flyby Solar Electric Encke Slow Flyby; Mariner Encke Ballistic Flyby; Solar Electric Encke Rendezvous 1981; Venus Orbital Imaging Radar; Solar Electric Out-of-the-Eliptic Probe 1979. Technical conclusions of mission studies are given in order that these results may interact with the broader questions of scope, pace, and priorities in the planetary exploration program. J.M.S.

N76-23130*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY MISSION SUMMARY. VOLUME 2: MARS POLAR ORBITER
Aug. 1974 14 p refs Sponsored by NASA 13 Vol.
(NASA-CR-147094; JPL-SP-43-10-Vol-2) Avail: NTIS HC $3.50 CSCL 03B
For abstract, see N76-23129.

N76-23131*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY MISSION SUMMARY. VOLUME 3: MARS SURFACE SAMPLE RETURN
Aug. 1974 12 p refs Sponsored by NASA 13 Vol.
(NASA-CR-147095; JPL-SP-43-10-Vol-3) Avail: NTIS HC $3.50 CSCL 03B
For abstract, see N76-23129.

N76-23132*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY MISSION SUMMARY. VOLUME 4: MARS ROVER
Aug. 1974 11 p refs Sponsored by NASA 13 Vol.
(NASA-CR-147096; JPL-SP-43-10-Vol-4) Avail: NTIS HC $3.50 CSCL 03B
For abstract, see N76-23129.

N76-23133# Oulu Univ. (Finland). Aarne Karjalainen Observatory.
MEASURES OF THE GALILEAN SATELLITES OF JUPITER
Jyrki Lukkari 1976 13 p ref
(Rept-26) Avail: NTIS HC $3.50

Plates, which were measured, were taken with the 40 cm Cassegrain telescope (f = 640 cm) of Aarne Karjalainen Observatory. The geographical coordinates of the observing site are lambda = 1 hr 43 mins 35 secs (25 degs 53 mins 50 secs), phi = 65 degs 05 mins 09 secs. The exposure times were 1 to 5 secs. During this time Io moved less than 0.030 secs, Europa less than 0.024 secs, Ganymede less than 0.020 secs, and Callisto less than 0.014 secs. Relative positions of the satellites were measured with Zeiss MKS 1,000 measuring component system. For each exposure, the coordinates of the satellites in a system are given. The central point of Jupiter defines the origin and x-axis is approximately parallel to the Jupiter's equator. The x-axis points to the east and the y-axis to the north. L.S.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N76-23134 California Univ., San Diego.
AN INFRARED CONTINUUM STUDY OF THE SOLAR ATMOSPHERE Ph.D. Thesis
Charles Allan Lindsey 1975 202 p
Avail: Univ. Microfilms Order No. 76-7815

A study of the temperature structure of the solar photosphere using five broad-band filters in the 10-30 micron region was made with the UCSD-University of Minnesota 60-inch telescope at Mt. Lemmon, Arizona. This provided a spatial resolution of approximately 10 arc sec. Results are presented and discussed in detail. The thermal structure of the chromosphere was also studied. Results of a two beam scans of the sun at submillimeter wavelengths indicate a small degree of limb brightening, approaching 1 percent at 0.8 solar radii. This is considerably smaller than would exist if the chromosphere were as smoothly stratified at the temperature minimum as the photosphere. The observations show considerable spatially resolved structure, both in active and quiet regions, but with less relative amplitude than is seen in millimeter and centimeter radio observations. The suppression of the expected limb brightening was studied and the existence of irregular granular structure with both horizontal and vertical characteristic sizes of order 1,500 km is suggested. High-resolution images in the wings of the K-line of ionized calcium show granular structure of about this horizontal scale.
Dissert. Abstr.

N76-23135*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
EMISSION OF NEARLY STRIPPED CARBON AND OXYGEN FROM THE SUN
R. K. Sciambi, G. Gloeckler (Arizona Univ.), C. Y. Fan (Max-Planck-Institut fuer Extraterrestrische Physik), and D. Hovestadt Aug.

1975 24 p refs
(Contract NAS5-11063)
(NASA-CR-144747; TR-76-022) Avail: NTIS HC $3.50 CSCL 03B

Energy spectra of nearly stripped carbon and oxygen nuclei were observed during several solar particle events indicating a systematic deviation of these spectra from a simple power law. The spectra bend below 100 keV per nucleon and the degree of turn-over are highly correlated with the size of the flare, as measured by the event averaged flux of 130 to 220 keV protons. The energy spectra of helium computed for the same time periods do not show a similar feature. A large variability of the alpha/CNO ratio from event to event (from 2 to about 20 at 40 keV per nucleon) is found, and, in all cases examined, the carbon and oxygen nuclei are nearly fully stripped. These results are interpreted as evidence for storage of energetic ions in hot (T sub e is approximatey 1.5 million K) coronal regions, followed by strong adiabatic deceleration. Author

N76-23136*# Hale Observatories, Pasadena, Calif. Big Bear Solar Observatory.
PRODUCTION OF A SHORT-LIVED FILAMENT BY A SURGE
H. Zirin Feb. 1976 14 p refs
(Grants NGR-05-002-034; NSF GA-43467X)
(NASA-CR-147090; BBSO-0154) Avail: NTIS HC $3.50 CSCL 03B

A large surge was observed on September 17, 1971 part of which, after travelling 200,000 km across the surface, returned to the surface to form a filament. The filament lasted about 30 minutes, then rose up and returned to the source of the surge. This was interpreted as the filling of a semi-stable magnetic trap. Analysis of the microwave radio burst showed it to have been produced by a source optically thick at 8,800 MHz, with area 4 (arc min)squared and T approximately 275,000 deg, N squared sub eV approximately 7 x 10 to the 48th power. The soft x-ray burst showed a component at 12 x 1,00.000 deg with N squared sub eV approximately 3 x 10 to the 48th power. Author

N76-23137*# Carnegie Institution of Washington, Pasadena, Calif.
THE LIFETIME AND EVOLUTION OF FIBRILS
K. A. Marsh Mar. 1976 32 p refs
(Grants NGR-05-002-034)
(NASA-CR-147103; BBSO-0156) Avail: NTIS HC $4.00 CSCL 03B

A detailed study was made of the lifetimes and evolution of fibrils in McMath 12417, using high resolution filtergrams in H alpha and CaII K made at Big Bear Solar Observatory. It was found that the lifetime of a fibril increases monotonically with its length. This relationship, together with the form of the variation of fibril lengths as a function of time, suggests that fibrils result from material being impulsively injected into magnetic field lines at approximately 30 km/sec, and returning under gravity. The lifetimes and apparent lengths of fibrils are then a function of the inclination of the field lines only. A study of wavelength scans through the H alpha line confirms that the apparent expansion and contraction of fibrils represents true mass motion. Author

N76-23138*# Carnegie Institution of Washington, Pasadena, Calif.
H ALPHA OBSERVATIONS OF THE 12 AUGUST 1975 TYPE 3-RS BURSTS
Barry J. LaBonte Feb. 1976 24 p refs
(Grant NGR-05-002-034; Contract F19628-76-C-0055; Grant NSF ATM-74-13849)
(NASA-CR-147098; BBSO-0155) Avail: NTIS HC $3.50 CSCL 03B

H alpha filtergram observations of a number of the Type III-RS (reverse slope) bursts that occurred on August 12, 1975 are presented. Solar radio emission was peculiar on that date in that a large number, and proportion, of the usually rare reverse slope bursts were observed. The radio bursts are shown to coincide in time with a homologous set of H alpha flares located at the limbward edge of spot group Mt. Wilson 19598. A model is proposed in which the reverse slope bursts are the downward branches of U bursts, whose upward branches are hidden behind the coronal density enhancement over the spot group. Author

N76-23139*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AE 6: A MODEL ENVIRONMENT OF TRAPPED ELECTRONS FOR SOLAR MAXIMUM
Michael J. Teague, King W. Chan, and James I. Vette May 1976 67 p refs
(NASA-TM-X-72597) Avail: NTIS HC $4.50 CSCL 03B

A projected inner zone electron model environment, AE 6, for the epoch 1980 is presented. It is intended to provide estimates of mission fluxes that spacecraft will encounter in the coming solar maximum years. AE 6 is presented by graphs of omnidirectional integral flux as a function of L shell, the ambient magnetic field B, and the energy E. Results of orbital integrations for altitudes from 150 n.m. to 18,000 n.m. are given for circular orbits with four different inclinations, using the AE 6 and the AE 4 solar maximum models for the inner and outer zones, respectively. The derivation of AE 6 is described, and a brief comparison is given of the radial profiles of equatorial fluxes from several related models. A short summary of the associated computer programs is included. Author

N76-23140# Technische Universitaet, Brunswick (West Germany). Lehrstuhl B fuer Theoretische Physik.
APPLICATION OF NUMERICAL PLASMA SIMULATION FOR CALCULATION OF PLASMA PERTURBATIONS CAUSED BY A SPACECRAFT IN THE SOLAR WIND [ANWENDUNG NUMERISCHER PLASMASIMULATION BEI DER BERECHNUNG VON PLASMASTOERUNGEN DURCH EIN RAUMFAHRZEUG IM SOLAREN WIND]
Ulrich Isensee Bonn Bundesmin. fuer Forsch. u. Technol. Oct. 1975 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-W-75-20) Avail: NTIS HC $4.50; ZLDI, Munich DM 13.25

The perturbation of the solar wind by a spacecraft was calculated. The surface is charged up, the streaming velocity causes a wake behind the probe, and photoelectrons are emitted from the sunlit side. The plasma electrons were simulated in a two-dimensional model using the particle-in-cell method. The ions were treated as neutral particles and the photoelectrons approximated. With regard to the Helios mission, computations were carried out with plasma parameters for conditions near earth (1.0 AU) and near sun (0.2 AU). Results were obtained for the potential distribution in the vicinity of the spacecraft, the floating potential, and the deformations of electron energy spectra. Author (ESA)

N76-23141# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 374, PART 1, (PROMPT REPORTS): DATA FOR SEPTEMBER 1975 - AUGUST 1975. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 366 (SUPPLEMENT) FEBRUARY 1975
Hope I. Leighton Oct. 1975 120 p
(PB-247137-374-1; SGD-374-Pt-1) Avail: NTIS MF $2.25 HC available from Natl. Climatic Center, Attn: Publications, Federal Bldg., Asheville, N. C. 28801. Subscription $34.00/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual supplement containing explanation is included $1.40/copy for either part: $1.30 for extra issue CSCL 03B

This is Part 1, prompt reports, of Solar-Geophysical Data for September 1975 and August 1975. The September 1975 includes sections on alert period, daily solar indices, solar flares, solar radio waves, solar wind measurements, spacecraft observations, solar X-ray radiation, and inferred IP magnetic field polarities. The August 1975 data includes sections on daily solar activity centers, sudden ionospheric disturbances, solar radio waves, cosmic rays, geomagnetic indices, and radio propagation indexes. GRA

N76-23142# National Center for Atmospheric Research, Boulder, Colo.
AN OBSERVATIONAL INVESTIGATION OF THE SOLAR

OBLATENESS Ph.D. Thesis - Colo. Univ.
Robin Tucker Stebbins 1975 173 p refs
(Contract NSF C-760)
(PB-247519/2; NCAR-CT-34) Avail: NTIS HC $6.75 CSCL 03B

In recent years, the sun's figure has come under close scrutiny because it may reflect certain properties of the solar interior, and because an aspherical solar mass would alter the interpretation of a basic test of gravitation theories. A flurry of activity in this area has been triggered by the 1967 report of an equatorial diameter significantly larger than the polar diameter. A measurement of the solar oblateness using different experimental techniques which finds no comparable oblateness is reported. Further, the evidence indicates an explanation for the disagreement between previous results. A number of other interesting facets of the sun are also revealed. GRA

N76-23143*# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solar-terrestrial Physics.
SYNOPTIC MAPS OF SOLAR CORONAL HOLE BOUNDARIES DERIVED FROM He 2 304 A SPECTROHELIOGRAMS FROM THE MANNED SKYLAB MISSIONS
J. D. Bohlin (Hulburt (E. O.) Center for Space Res.) and D. M. Rubenstein (Hulbert (E. O.) Center for Space Res.) Nov. 1975 26 p refs
(NASA Order S-60404-G)
(NASA-CR-147224; PB-247916-51; UAG-51; NOAA-75120901) Avail: NTIS MF $2.25; HC available from National Climatic Center, Atten: Publications. Federal Bldg., Asheville, N. C. 28801. Subscription $25.20/year. $0.54 this issue CSCL 03B

The disk boundaries of coronal holes have been determined from He II 304 A spectroheliograms which were taken with the Naval Research Laboratory slitless XUV spectrograph during the manned Skylab missions. These boundaries are plotted by Carrington rotation as synoptic charts in both the standard rectangular as well as polar-view projections. The periods of time for which boundaries were determined are 24 May through 28 June 1973 (first manned Skylab mission), 2 August through 24 September 1973 (second manned mission), and 21 November 1973 through 2 February 1974 (third manned mission); the Carrington rotations covered (in part or totally) are 1601 and 02; 1603, 1604, 05 and 06; and 1608, 09 and 10, respectively. GRA

N76-23080* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ARTIFICIAL SOLAR ECLIPSE EXPERIMENT MA-148
R. T. Giuli, M. D. Jenness, A. N. Lunde, and K. A. Young *In its* Apollo-Soyuz Test Project Feb. 1976 5 p (For availability see N76-23074 13-88)
CSCL 03B

N76-23083* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRATOSPHERIC AEROSOL MEASUREMENT EXPERIMENT MA-007
T. J. Pepin (Wyoming Univ.) and M. P. McCormick *In its* Apollo-Soyuz Test Project Feb. 1976 8 p (For availability see N76-23074 13-88)
CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N76-23144 California Univ., San Diego.
GALACTIC COSMIC RAY PRODUCED RADIOACTIVITY IN LUNAR AND CHONDRITIC MATERIALS Ph.D. Thesis
Candace Phelps Kohl 1975 172 p
Avail: Univ. Microfilms Order No. 76-7813

Using radiochemical techniques, activities of cosmic ray produced radionuclides were measured in lunar materials as functions of depth and in two meteorites. Chemical separation and purification procedures for Be, Na, Al, Fe, and Co in these silicate samples are discussed. A Beta Gamma coincidence counter was used to measure Na-22 and Al-26, a Beta scintillation spectrometer was used for Be-10 and Cl-36, an X-ray counter for Fe-55 and a Ge(Li) well crystal for Be-7 and Co-56. Measurements of Be-7 in extraterrestrial materials are reported for several Apollo 17 soils and the Canon City meteorite. A Be-10/Be-7 activity ratio of 0.13 + or - 0.03 was obtained for both lunar and chondritic samples. In addition, the San Juan Capistrano meteorite was obtained as a recent fall and measured for cosmogenic radionuclides, rare gases and particle tracks. Results indicate that the recovered pieces came from near the center of a small, approximately 8 cm radius, preatmospheric body. Dissert. Abstr.

N76-23145*# Scientific Translation Service, Santa Barbara, Calif.
RADIATION SAFETY OF SPACE FLIGHTS. RADIOBIOLOGICAL ASPECTS
Yu. G. Grigoryev Washington NASA Apr. 1976 359 p refs Transl. into ENGLISH of the book "Radiatsionnaya Bezopastnost-Kosmicheskikh Poletov. Radiobiologicheskiy Aspekty" Moscow, Atomizdat Press, 1975 p 3-246
(Contract NASw-2791)
(NASA-TT-F-16853) Avail: NTIS HC $10.50 CSCL 03B

Dose characteristics of the possible radiation on man in space are given as well as criteria for evaluating the radiation danger of space flights. Data on the biological effect of protons and heavy ions and the results of radiobiological experiments in space are presented, and the modifying action of physical factors of the environment on the radiobiological effect is discussed. Author

N76-23146# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ANNIHILATION OF MATTER AND ANTIMATTER AND THE COSMIC X-RAY BACKGROUND
P. Carlqvist and B. Laurent (Stockholm Univ.) Oct. 1975 11 p refs
(TRITA-EPP-75-21) Avail: NTIS HC $3.50

A cosmologic model for the cosmic X-ray background radiation mechanism is suggested. This model is based on inverse Compton scattering of galactic photons on relativistic annihilation electrons. Author (ESA)

N76-23147# Lund Univ. (Sweden). Dept. of Physics.
APPLICATION OF TRACK FORMATION THEORY TO CALIBRATION OF PHOTOMETRIC MEASUREMENTS ON COSMIC RAY TRACKS IN NUCLEAR EMULSION
S. Behrnetz Sep. 1975 26 p refs Sponsored by Swed. Nat. Sci. Res. Council
(LUIP-CR-75-05) Avail: NTIS HC $4.00

The delta-theory of Katz is applied to charge calibration of cosmic ray particle in nuclear emulsion using particle spectra obtained by photometric track width measurements of selected samples of tracks in emulsion stacks exposed to cosmic radiation in a high altitude balloon flight. Measurements were made with photometric technique on nuclei in the charge interval magnesium to nickel. With two parameters of the theory determined by a fit to experimental data it is possible to obtain theoretical charge scales which agree with experimental ones. An attempt is made to expand the theory down to the carbon-oxygen region. Author (ESA)

N76-23148# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
COSMIC-RAY PENUMBRAL EFFECTS FOR SELECTED BALLOON LAUNCHING LOCATIONS Interim Report
D. F. Smart and M. A. Shea 26 Nov. 1975 8 p refs
(AF Proj. 8600)
(AD-A018094; AFCRL-TR-75-0600) Avail: NTIS CSCL 04/1

The penumbral characteristics as determined from cosmic-ray trajectory calculations are compared for several balloon launching locations in the Western Hemisphere including Palestine, Texas, Cape Giradeau, Missouri, and Sioux Falls, South Dakota. Penumbra for a number of zenith and azimuth angles were calculated in

an effort to determine the transmittance function for balloon detectors viewing over a specific solid angle. GRA

N76-23149# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE EFFECT OF IONIZATION ENERGY LOSS ON THE CALCULATION OF RIGIDITY TRANSMITTANCE FUNCTIONS Interim Report
D. F. Smart, M. A. Shea, and J. A. Lezniak 26 Nov. 1975 8 p refs
(AF Proj. 8600)
(AD-A018091; AFCRL-TR-75-0597) Avail: NTIS CSCL 04/1
The authors have used the detailed trajectory tracing method to calculate the rigidity transmittance function for a cosmic ray detector at balloon altitude at a mid-latitude location. GRA

N76-23077* Naval Research Lab., Washington, D.C.
SOFT X-RAY OBSERVATION EXPERIMENT MA-048
S. Shulman, G. Fritz, D. Yentis, R. G. Cruddace, H. Friedman, W. Snyder (Johns Hopkins Univ.), and R. C. Henry (Johns Hopkins Univ.) *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 11 p (For availability see N76-23074 13-88)
CSCL 03B

N76-23078* California Univ., Berkeley.
EXTREME ULTRAVIOLET SURVEY EXPERIMENT MA-083
S. Bowyer, B. Margon, M. Lampton, F. Paresce, and R. Stern *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p refs (For availability see N76-23074 13-88)
CSCL 03B

N76-23079* California Univ., Berkeley.
INTERSTELLAR HELIUM FLOW EXPERIMENT MA-088
S. Bowyer, J. Freeman, F. Paresce, M. Lampton, and B. Margon *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 15 p refs (For availability see N76-23074 13-88)
CSCL 03B

N76-23081* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRYSTAL ACTIVATION EXPERIMENT MA-151
J. I. Trombka, E. L. Eller, R. L. Schmadebeck, C. S. Dyer (Md. Univ.), R. C. Reedy (LASL), D. W. Barr (LASL), J. S. Gilmore (LASL), R. J. Prestwood (LASL), B. P. Bayhurst (LASL), D. G. Perry (LASL) et al *In its* Apollo-Soyuz Test Project Feb. 1976 10 p refs (For availability see N76-23074 13-88)
CSCL 03B

99 GENERAL

N76-23150# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
[RESEARCH ACTIVITIES OF THE GERMAN AVIATION AND SPACE RESEARCH INSTITUTE] Annual Report, 1974 [DFVLR JAHRESBERICHT 1974]
Jun. 1975 435 p refs In GERMAN
Avail: NTIS HC $11.75
Activities of several institutes include flow mechanics, flight mechanics and flight control, materials and constructions, propulsion systems, electronics, atmospheric physics, environment simulation, and flight medicine. ESA

N76-23151# European Space Agency, Paris (France).
ACTIVITIES OF THE EUROPEAN SPACE RESEARCH ORGANISATION Annual Report, 1974
[1975] 264 p refs
Avail: NTIS HC $9.00
Communication satellite programs include telecommunications and aeronautical and maritime satellites. Results from scientific satellites are presented, and scientific and meteorological satellites are discussed under development (COS-B, GEOS, I4E, ISEE, Exosat, Meteosat). The Spacelab program is dealt with and the Ariane launcher program is reviewed. Future program studies include applications, scientific projects, and Spacelab utilization. General activities such as ground installations, space technology, and Space Documentation Service are presented; administration activities such as finance, personnel, industrial policy, and contracts are reported. In annexes names of national delegates, members of the various subprograms, and lists of publications, scientific, and technical reports, contracts approved in 1974, and symposia and colloquia are given. ESA